THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXI. No. 1552.] LONDON, FEBRUARY 7, 1893. [45TH YEAR. PRICE 6d.

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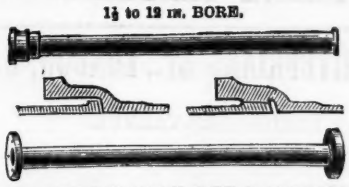

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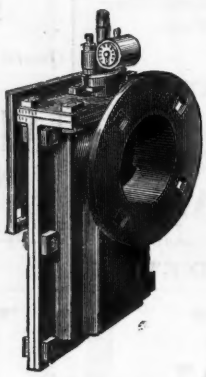

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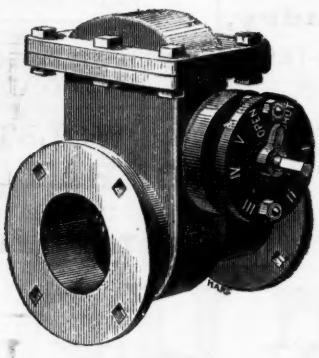

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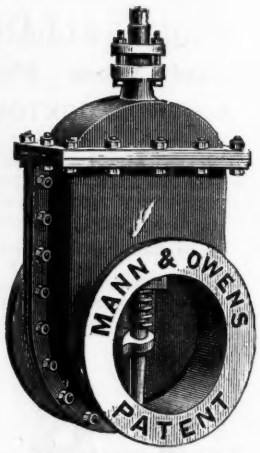

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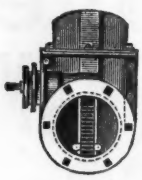

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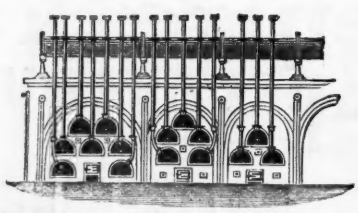

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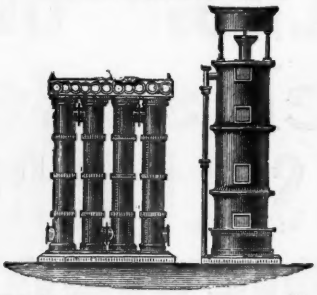

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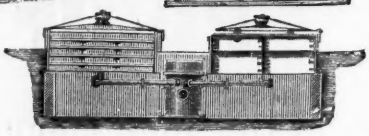

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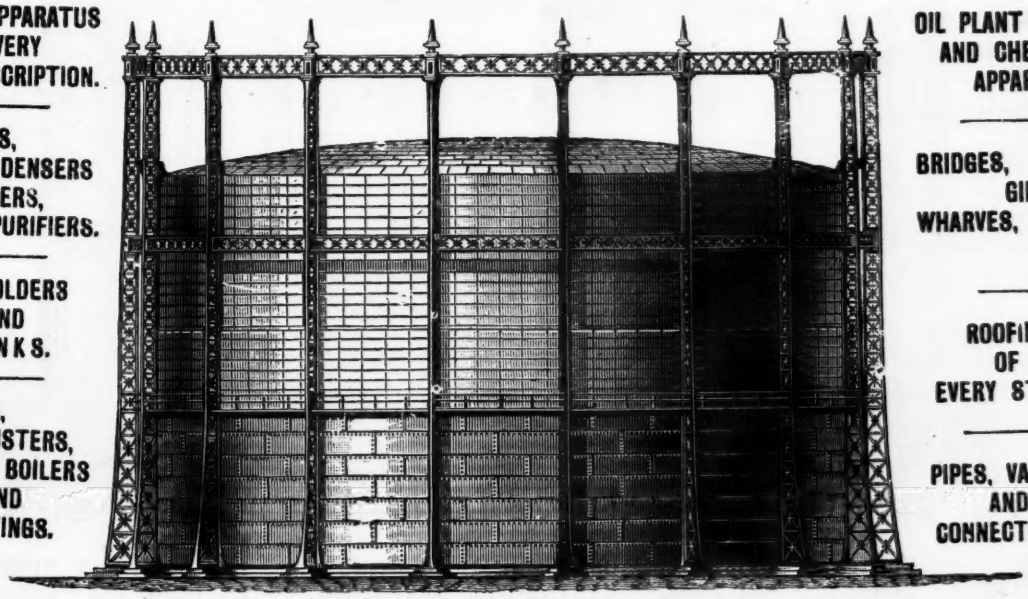

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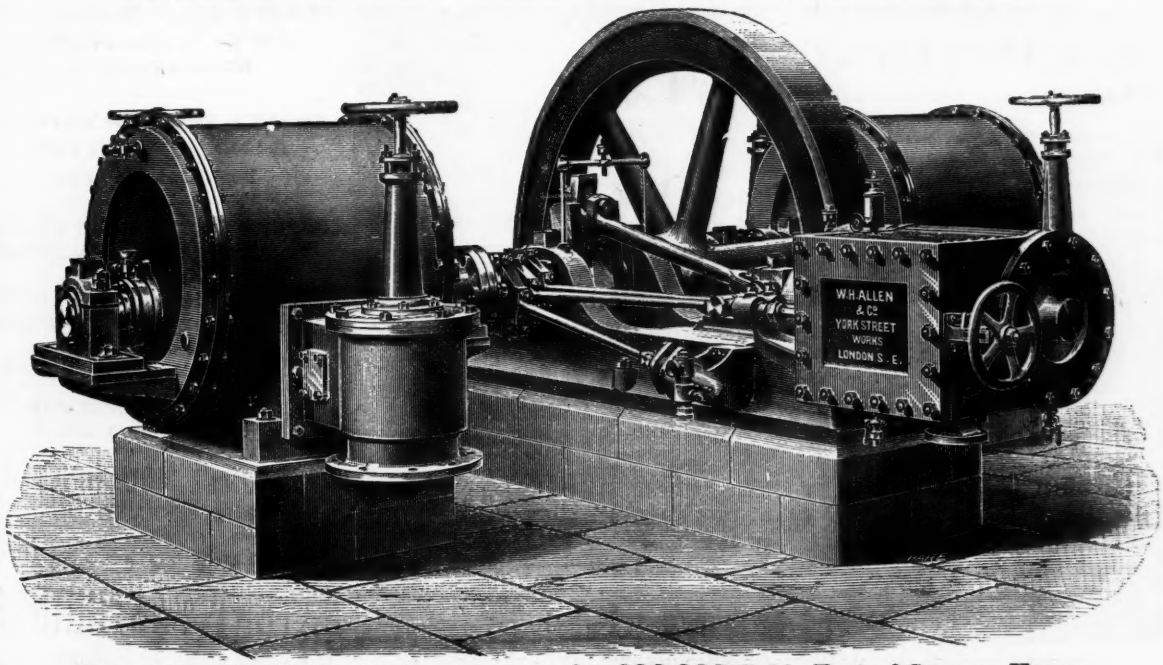

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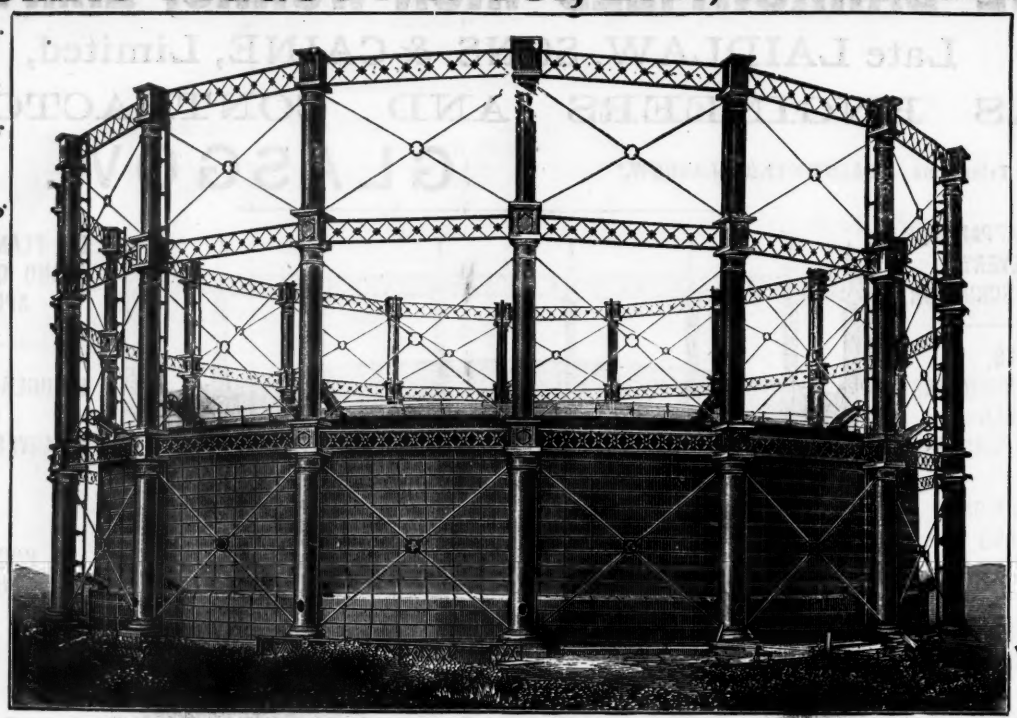

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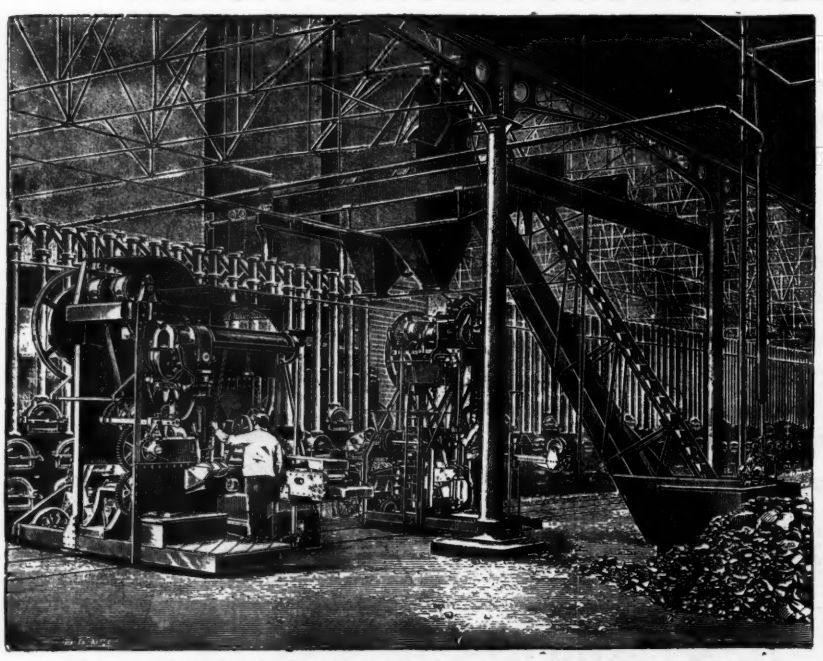

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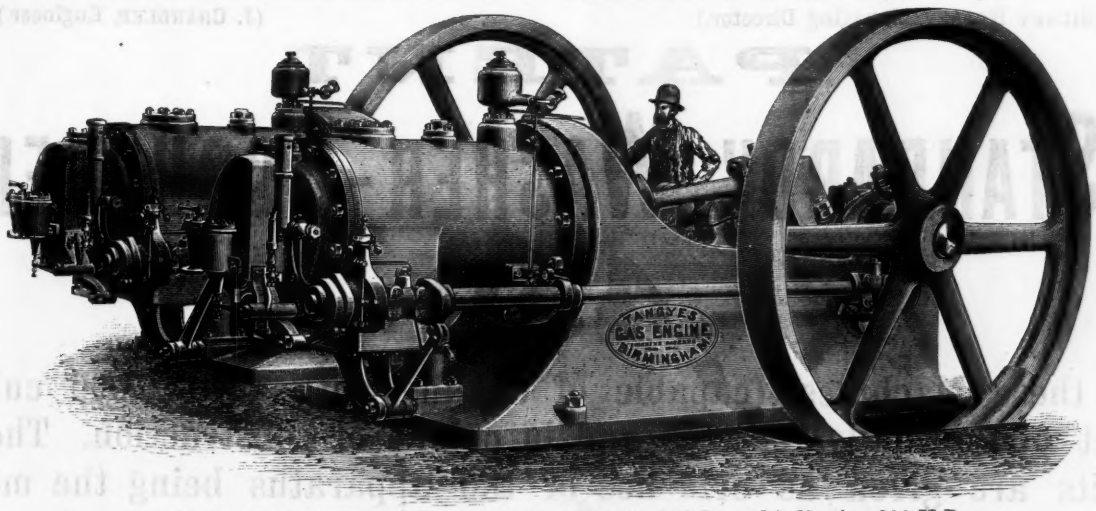

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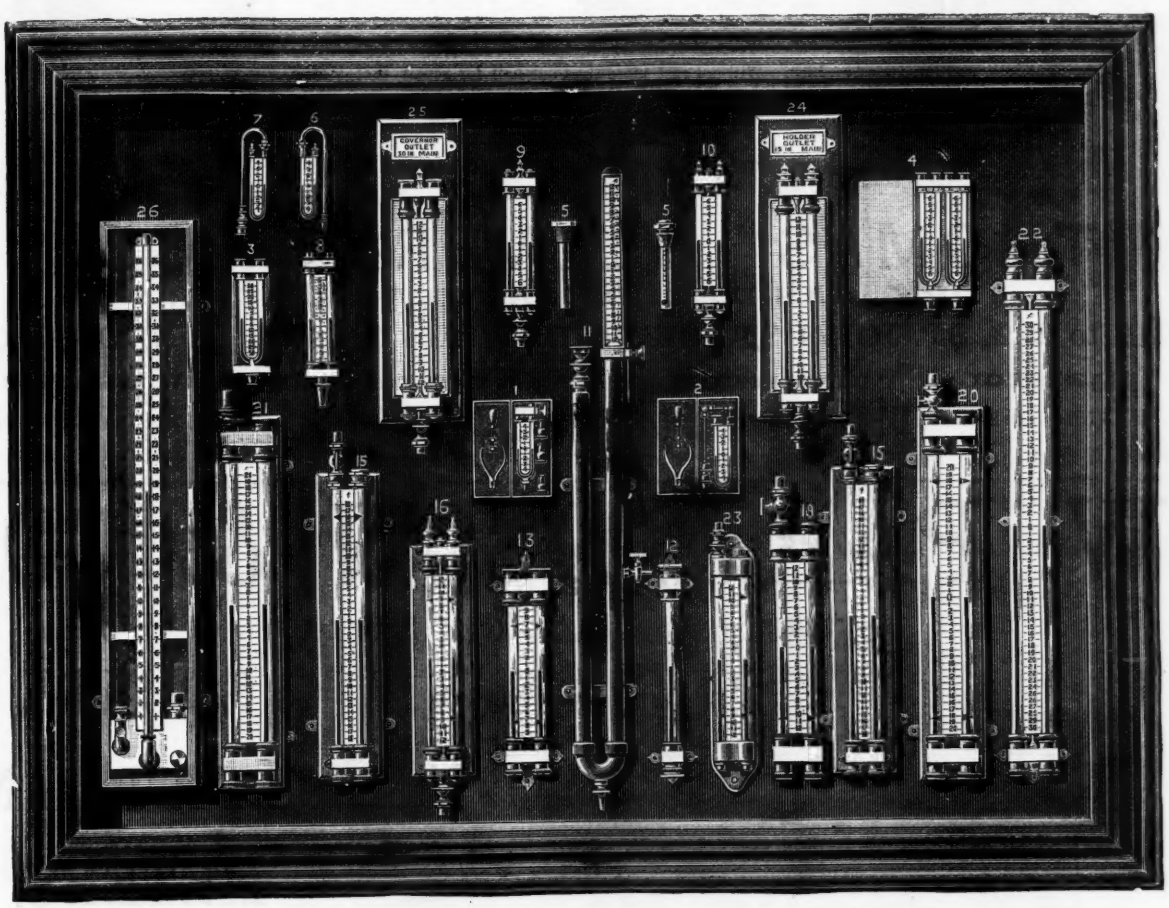

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(See also Advt., p. 252.

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TUESDAY, FEBRUARY 7, 1893.

The Meeting of The Gaslight and Coke Company.

THE general meeting of The Gaslight and Coke Company on Friday last was of exceptional interest; the proceedings being enlivened by several "incidents" of a more dramatic character than are usually to be met with in connection with assemblies of this kind. Indeed, it was the liveliest meeting that the Horseferry Road has known since the memorable one, eleven years ago, when there was a stormy division, followed by an adjournment, over a personal question concerning the relations of an officer of the Company with an electric lighting venture. Of late years, there has been constantly present at these meetings, but not always manifest, an undercurrent of discontent with the administration of the undertaking, and dissatisfaction with the position to which the Company has been brought as the result of the operation of influences that have been recognized as pernicious, but which it has been almost impossible to identify. Not one shareholder in a hundred of those who make a practice of attending these gatherings, at which the Directors are theoretically supposed to give an account of their stewardship, and submit themselves to the judgment of their constituents, knows what is the matter with the Company; but that a feeling of uneasiness on the part of a good many shareholders respecting the condition of the undertaking has existed, does exist, and ought to be removed, is too obvious to be overlooked by such an experienced man of affairs as Colonel Makins. The grounds of this dissatisfaction are patent enough. Here is an undertaking which has, by a snowball process of enlargement, combined with natural growth, attained to a vast and overshadowing bulk. Now, there is nothing admirable in mere bulk. It was not the object of the Legislature, when it permitted the Chartered Company to absorb its smaller neighbours one after another, that the Directors of the united organization of gas supply for the greater portion of London should vapour about the volume of their revenues, or even take £35 apiece for attending once a fortnight to receive the reports of their officers, and doing whatever they were told to do. The sole reason for putting the Chartered into its actual paramount position was that gas might be cheapened, through the saving of superfluous expenditure by centralization, and by utilizing for the amalgamated district the superior facilities for gas manufacture offered by the Beckton establishment. Is it unnatural for people, both inside and outside the Company upon which this great experiment has been made, to ask how it has worked? And when the question is asked, what is the reply? That the expected economies have not been realized, either in regard to capital expenditure or to working expenses; that The Gaslight and Coke Company charge the highest price for gas in all London; that a magnificent reserve fund has been heavily drawn upon to keep things going; and that there is no prospect of an improvement in the near or the distant future, seeing that weaknesses, pointed out again and again by competent critics, are persisted in, and every attempt to bring administrative errors home to their perpetrators is scouted as "bad taste" because it is made by somebody who ought not to interfere, or because it is directed at somebody who ought not to be mentioned.

It is quite idle for Colonel Makins to expect everybody interested in the British gas industry in general, or in Chartered affairs in particular, to refrain from saying unpleasant things out of regard for the susceptibilities of this or that individual officer. The Gaslight and Coke Company, as the Governor is apt at saying whenever it suits his purpose, do not stand on the same footing as any other Company nominally of the same kind. He can make some very astonishing comparisons when he likes; but this by the way. In many respects, and to some extent, we agree with Colonel Makins that the undertaking for which he is the official apologist is not as others. Its magnitude brings it unique responsibilities. It is the cynosure of the world of gas makers, sellers, and consumers, and the mark of those who bear the gas industry no good will. Local authorities watch it; financiers quote it; technicians and the exploiters of cognate industries swear by or at it, as their mood impels them. It is absurd for anybody upon whom a finger can be laid as responsible for the policy of such a vast concern to plead the privilege of a private person, or even the degree of personal immunity that might be claimed for a small man in a small place. All the positions of trust and responsibility in The Gaslight and Coke Company are big places, and should be filled by big men, who should be able to defy any critic to pick holes in their policy. But it is useless for a gas director to try to "ride the high horse" when his accounts are so queer as those of The Gaslight and Coke Company.

One might have thought it time for the old trick of pleading the higher initial price as a warrant for an exorbitant selling rate to be abandoned by the Chartered apologists. If, as Colonel Makins says, the Company cannot hope to compete, in the matter of selling price, with

the South Metropolitan, how does this explain their inability to keep alongside the Commercial, whose initial price is the same as their own? This, however, is not the question that arises most exiguously out of the latest Chartered accounts, which is, why their coal costs so much more than the South Metropolitan supplies, both in the gross and the net. How, in the first place, is the 13s. 10d. per ton to be explained, seeing that, as Mr. Livesey puts it, this coal is bought in the North of England at the same average price as that which costs the southern concern 2s. per ton less? Colonel Makins talked about lighterage in this connection; but, surely, this charge weighs upon the South Metropolitan Company, whose largest works are on a canal and above bridge, more than on the owners of Beckton. What is the good of Beckton if the coal cannot be got into it cheaply? There is a rumour afloat that, owing to the awkward arrangement of the Beckton plant, the coal costs a good deal in transit from the jetty to the retort-houses; but this cannot account for the extra 2s. per ton, the saving of which would mean so much to the Chartered Company.

As to residuals, it cannot be said that Colonel Makins succeeded last Friday in persuading the critics of the administration that the Company's system is the best that could be followed; although it may be, as he claimed for it, a better one than was formerly in vogue—which in its day, no doubt, was quite as vehemently defended from the Chair. The fact is, people take these directorial declarations with a good many grains of salt; and, with all due respect be it said, the Governor has not been so candid in his explanations on this head as to carry conviction with every statement he may offer on this vexed subject. His own figures are against him; and while other Companies can make so much more by selling residuals than the Chartered can obtain, Colonel Makins must expect people to complain of the working of the arrangements, whatever their nature, which put the Company in so unfavourable a position. "The proof of the pudding," &c.

So far as his own speech and his management of the meeting were concerned, Colonel Makins did very well on Friday, under most depressing conditions. He was evidently suffering from a severe cold, which must have made the task of speaking to a large assembly painful to him; but he conducted the lengthy proceedings to a peaceful close with an urbanity and presence of mind that did him great credit. We desire to express the regret which will be generally felt at the news that, for the first time for some 34 years, Mr. J. Orwell Phillips, the Secretary and General Manager of the Company, was prevented by illness from occupying his usual position at the Governor's left hand. It is not too much to say that the place of meeting did not look the same without that alert, keen face and erect figure, which were wont to represent to the shareholders the master-spirit of the Company. We sincerely hope that Mr. Phillips will be speedily restored to his post. It was to be deplored that a question raising the principle of the participation of the officers of the Company in outside business should have come to be asked and discussed in the Secretary's absence; and we shall refrain from going into the matter at any length here—reserving the right to return to the subject at any convenient season. We will say this, however, and without fear of contradiction, that Mr. Phillips, throughout his long connection with the Chartered Company, has been the hardest worker in and for the undertaking; and his powers of work are such as to absolve him from many of the limitations that might apply to ordinary men. With this qualifying observation, it may be admitted that Mr. Foster scored heavily against the Board on the question of officials and directorships.

The Meeting of the Incorporated Institution of Gas Engineers.

According to the announcement made in last week's Journal, the formal annual general meeting of the Incorporated Institution of Gas Engineers was held last Saturday, at the offices of the Institution, No. 11, Victoria Street, Westminster. The retiring President—Mr. Charles Hunt, of Birmingham—occupied the chair; and there was only a small attendance of members of the Council, the business transacted being wholly of a routine character. Upon the report of the Scrutineers of the balloting-papers for the officers for the ensuing year, Mr. John Methven, of Beckton, was declared to be elected President, and Mr. W. Foulis, of Glasgow, Vice-President. Mr. T. Banbury Ball, of Rochdale, Mr. W. Hardie, jun., of North Shields, and Mr. Henry Peaty, of Burslem, were elected to the Council. A number of new members were added to the Institution; and the meeting then formally adjourned to the 10th of May, at the Institution of Civil Engineers, when the President will deliver his Inaugural Address, and papers will be read and discussed. With reference to the latter subject, it is to be hoped that the Council are bestirring themselves to procure a sufficiency of the right class of communications, in order that the credit of the Institution may be maintained. Nothing could be better than the work already done, under the auspices of the organization, by way of contributing to the higher order of technical literature; but there is always a little uncertainty as to whether any meeting of such a society will be worthy of those that have gone before. This particular Institution has the great advantage over others in the same field, that it is as yet too young to have any veterans. The "front bench" of prominent members may therefore be called upon to justify their eminence; and nobody has a right to pose as a past-master. Limited as the membership of the Institution is, moreover, it embraces not a few energetic young men who have a reputation to make in the matter of technical authorship; so that there should not be much difficulty in getting as many eligible papers as may be required. It is to be hoped, also, that the Council will bear in mind the important truth that discussion is the life and soul of a gathering such as they are arranging to hold three months hence. There are several kinds of ideal papers; one being the paper which is not only interesting and instructive in itself, but is the means of extracting instructive comment from those who may be regarded as competent to discuss it. Other kinds of papers there are which enhance the value of the printed Transactions of a society more than they add to the brilliancy of the meeting. Now that it is customary to distribute advance prints of papers to be read at technical meetings, the prospect of getting up good discussions thereupon is very greatly improved; and the irritating personage whose habit it was to preface his remarks upon a paper by stating that he "really had not "looked into this particular subject" is not such a common object of assemblies of this character as formerly. It may be suggested that the Council of the Institution might consider the feasibility of making sure of at least one good discussion at the May meeting, by arranging for somebody to "kick off" a question of the day, to be followed by a few selected speakers in a certain prescribed order. This would involve the early communication from every speaker to his follower of the general nature of his views, but would not exclude *ex tempore* effects. A proceeding of this kind requires a little tactful planning; but the possibilities of obtaining a really brilliant result are very great. We do not care to emphasize the suggestion by naming any debateable subjects—mainly, perhaps, because when we get hold of a controversial topic, we like to discuss it in our own columns. But there must be plenty of issues round about which a really lively *vivâ voce* discussion might be got up, if it were properly set about, without the somewhat cramping formality of introducing the subject by the laborious method of a "paper." The Institution is again fortunate in the choice of a President; Mr. John Methven being as safe for a clever and suggestive address as he is to make himself agreeable to everybody who may attend the meeting.

The Last Question of the Labour Commission.

The Labour Commission have concluded the taking of evidence, and will now proceed to consider their report. There may be wide speculation concerning the nature of the report, or reports; but we do not expect anything very remarkable in this line. Still less do we look for any new departure in the way of legislation as the effect of the inquiry. The people who spend their time in crying for some quick and simple remedy for the evil of poverty will in all probability be disappointed with anything the Commissioners may have to advise for the remedying of detail imperfections and shortcomings in the existing industrial system, and will jeer at whatever opinions they may express which have the disadvantage of support by facts. The last question of the Commission was asked by Mr. George Livesey, of the Socialist H. M. Hyndman; and he succeeded in exhibiting in a lurid light the disconnection of socialistic dreamings and this work-a-day world. Mr. Hyndman had been denouncing capital and the capitalist

with the fervour and the incoherency of his order; and on being asked by Mr. Livesey whether he objected to the exercise, on the part of the working classes, of thrift which would have the effect of converting them into small capitalists, he answered unhesitatingly in the affirmative. He thought that, by saving money, workmen only intensify competition, and fortify the class which they should endeavour gradually to supplant. In the pursuit of this noble ideal, the working classes are to squander their earnings as fast as they get them, and throw themselves into the workhouses when their time comes, as witnesses to the need for the destruction of all capital. Well, this only goes to show that your Socialist not only "dreams dreams," but tries to project himself into a space of four dimensions in which things are to have values very different from those belonging to them here. Meanwhile, however, do Socialists who happen to have any means of living besides sponging upon Trades Unions act up to these principles, and scorn to lay by for a rainy day? It would be instructive if somebody who knows the facts would answer this question.

Assessors in Law Courts.

A NOTEWORTHY precedent in regard to the adjudication of patent cases was started last week by Mr. Justice Wills, in sitting with Professor Forbes, F.R.S., as Assessor, for the hearing of an action in which the plaintiffs claimed, as proprietors, an injunction restraining the defendants from infringing certain letters patent, an account of profits, and damages for past infringements. In the event, the defendants submitted to an injunction with costs; and so the matter ended, it may be presumed, to the satisfaction of both parties. We mention the case here because it exemplifies the carrying out of a judicial reform which we have long advocated, at least for an experiment. It would not, perhaps, be a too far-fetched opinion to ascribe this proceeding of Mr. Justice Wills to the desire which the Judges of the High Court have expressed to do something to restore public confidence in the regular tribunals. It has long been argued that the procedure observed in the Admiralty Court, where the Judge always sits with technically trained assessors, might be copied in the Chancery Division in regard to patent cases; and we have often supported the view that the correct place for experts engaged for the purpose of assisting the Judge to arrive at a right decision in such cases is beside the Bench, and not in the witness-box. There are always at least two sides—sometimes there are more—to every question; but the task of putting forward one of them as embracing "the truth, the whole truth, and nothing but the "truth" should be left to those who have a natural interest in the issue. There is no objection to the employment of an expert to get up a case and assist in prompting Counsel; but it is bad for science when one of its professors is seen in a witness-box "swearing according to 'his proof." These same professors are in the habit of taking very high ground when they address their pupils and the general public upon the holiness of scientific truth, and the satisfaction that its disinterested pursuit brings; but it would read strangely if they were to confess, by way of commentary upon these high-winded effusions, what everybody in business knows to be the fact—that many a man great in the world of science makes more money out of swearing to order in the witness-box than he can earn in any other way. Professor George Forbes is a clever man, and there are others quite as good as he; and we are ready to do them all the credit of believing that they would rather help a Judge than confuse him. So long as the expert witness system prevails, however, will science be subjected to the humiliation of being suborned to aid and promote miscarriages of justice; for scientific men must live, and if, when an eminent F.R.S. receives a fat cheque for helping someone to destroy a worthy man's patent, he murmurs, like the Roman Emperor, "*Non olet*," who is there virtuous enough to condemn him?

Dr. N. K. Marsh, who has for many years past taken an active part in the work of the Liverpool Corporation Water Committee, died suddenly last Thursday; the immediate cause of death being the rupture of a blood vessel.

The Appeal in the Gadd Case.—Last Thursday the appeal in the case of the *Mayor, &c., of Manchester v. Gadd and another* was presented to the House of Lords and read, and the respondents were ordered to lodge a printed case in answer thereto on or before the 16th prox.

WATER AND SANITARY AFFAIRS.

AN elaborate report on "The Flow of the Thames," in relation to the water supply of the Metropolis, has been laid before the London County Council by their Chief Engineer, Mr. A. R. Binnie. The document states that, in consequence of certain returns of the daily flow of the river at Teddington Weir, and other information recently made public, "it has become possible, for the first time, "to arrive at some general and accurate conclusions on "the subject, in a way which hitherto has been impracticable." Mr. Binnie at once combats the idea that the flow of the Thames is rendered comparatively uniform on account of the autumn and winter rain being stored up "in what some persons call 'vast underground reservoirs;'" that is to say, in the fissures and pores of the permeable rocks among which the river takes its rise. He considers there are indications that the strata of the chalk and the oolites are not quite so porous, and do not retain the rainfall which they absorb for so long a period, as might be supposed. The leading data on which he proceeds comprise the amount of rainfall, and the quantity of water which flows out of the ground. This latter quantity is represented by the flow at Teddington Weir, *plus* the amount abstracted above Teddington by the London Water Companies. But it appears to us that, while this is all very well so far as it goes, Teddington Weir is not the Thames Valley, nor does the flow at that spot, with the addition of what the Water Companies abstract, necessarily represent all that comes down the valley from the region above it. The drainage area which Mr. Binnie includes consists of 3789 square miles. As a result of the rainfall, we are only presented with the quantity which comes to the surface; for Mr. Binnie merely believes in what he sees, and calculates all is lost that does not travel down the intakes or come to Teddington Weir. The underground world of waters concerns him not. In the nine years 1883-91, the average annual rainfall of the district was 27·01 inches; but the "flow "from the ground" was only 8·49 inches. Hence 18·52 inches, or about 1800 tons per acre, remain to be accounted for. Concerning this enormous volume of water, Mr. Binnie says he has entirely "failed to find any trace" of its whereabouts. It has all "evaporated." So much as vegetation takes up is "lost," as in the process of Nature it can never be returned to the river; being either evaporated from the surface of the vegetation in summer, or during the fall of the leaf in the chill days of autumn. That which vegetation does not take is still more quickly dissipated. If all that fails to appear in the river thus goes up to the skies, in vain should we look for water beneath the surface of the ground. In that case, what is the meaning of the deep wells, and the gushing depths of the Colne Valley? If the natural storeage were so slight, there would seem to be just a risk that the Thames above Teddington, together with all its tributaries, might even vanish away during a prolonged absence of rain.

In the course of Mr. Binnie's report, Mr. G. J. Symons is cited to prove that, in respect to the area under consideration, if the conditions are normal, "the water run"ning off from any given fall of rain will all reach "Teddington before the tenth subsequent day." If there is no store, and there is no rain for ten days, so much the worse for the river. This is understood to be the order of things in summer. In winter, the interval of time before the rainfall runs away becomes considerably longer. But the question may be whether "all" ever gets to Teddington, and whether some of it does not sink below the level of the river-bed, to reappear farther off. Whence the wealth of water in the underground strata between London and the sea, of which the Royal Commissioners heard from Mr. Topley? Mr. Easton also gave it as his conclusion that, in all the subsidiary chalk areas of the basins of the Thames and the Lea, there existed a large quantity of water which was passing away into the sea without being of the slightest benefit to anybody. We further observe that Mr. Binnie's adverse deductions are not quite so absolute as would at first sight appear. Thus he says that, "if no artificial means are adopted for storing waters flow"ing from the chalk areas," the available supply that can be depended upon as a certainty must be the minimum flow in the drier months of the year. This is true enough; but the "if" is significant. Farther on in the report we read

that during the summer months the springs flowing from the chalk and oolite are almost exhausted; "so that it "would be almost impossible, without the construction of "artificial reservoirs, to obtain the large volumes of water "which would be required for the supply of London." The question thus becomes simple enough, only Mr. Binnie proceeds to complicate the problem by suggesting the impracticability of constructing the requisite reservoirs in the valley of the Thames. As for the extent to which London is trespassing on its present resources, a table is given from which we deduce the fact that, on an average of the nine years 1883-91, the quantity of water abstracted by the Companies from the Thames was less than 7 per cent. of the flow. Taking the last year of the series, the proportion does not exceed 7 per cent. As against the minimum flow, the proportion would, of course, be higher. But, while Mr. Binnie's report is a very able production, it fails to demonstrate that the available water supply of the Thames Valley is likely to become inadequate for the population within any period sufficiently near to make it a question of the day.

Southern District Association of Gas Engineers and Managers.—The annual meeting of this Association will take place at the Holborn Restaurant on Thursday next. After the transaction of the routine business, the report of the Committee will be presented: and the President (Mr. C. C. Carpenter, of Vauxhall) will deliver his Inaugural Address. At the close of the meeting, the members will dine together.

Death of Mr. Peter Hancock.—A painful sensation was caused in Middlewich last Wednesday, by the discovery, in the North Stafford Canal, of the body of Mr. Peter Hancock, who since their establishment has been Manager of the Middlewich Gas-Works, prior to which he superintended the Sandbach Gas-Works. Deceased, who was well known throughout Cheshire, left the works about two in the morning; and it is supposed that, in walking to his house, the back door of which adjoins the towing-path, he fell into the water.

Increase in the Salary of the Batley Water-Works Manager.—At the last meeting of the Batley Corporation, the salary of Mr. Oscar J. Kirby, the Manager of the water-works, was increased by £25 per annum. As a more substantial advance was made only in July last, it is satisfactory to find that the Corporation appreciate the services rendered to them in the management of their water undertaking, which cost £360,000, and are desirous of retaining them. Mr. Kirby has also been permitted to undertake private professional work.

Utilizing the Heat of Chimney Gases.—In a recent number of the *Journal des Usines à Gaz*, an account was given by MM. Brouardel and Brandt of the manner in which boilers are heated at Toulouse by the waste gases from regenerative gas-furnaces. Each furnace is used for heating nine retorts; and the escaping gases from twelve furnaces are carried by a flue to a boiler 50 yards distant. The temperature of the gases on leaving the furnaces is 800° C.; and after traversing the flue, 700° C. Before leaving the boilers, the temperature falls to 300° C.; more than 50 per cent. of the heat of the gases having done duty in the evaporation of water. Only a small portion of the steam generated is required on the works; and therefore it is proposed to use the surplus for driving dynamos for electric lighting.

Employing the Waste Products of Petroleum Distillation.—In a recent number of the *Chemical Trade Journal*, particulars are given of a system adopted in New York for the utilization of the waste products of the distillation of petroleum or hydrocarbon oils. When these oils are employed in the manufacture of gas, there remains a residue, consisting of water and heavy oil, after the lighter portions are distilled away. At the works of the Pacific Gas Improvement Company, in New York, the residue has been allowed to run to waste, as it was not considered to be of any value for fuel or other purposes. A member of a firm whose shop is near the works now uses this material as fuel under a boiler. He employs an apparatus in which two surfaces are constantly rubbed together while the mixture is fed between them, so that the mechanical rubbing acts to separate the heavy oil from the water, and allow the latter to flow off. When this separation has once been made, the oil will not again mingle with the water; and being slightly heavier, it will gradually sink. In order to make a complete separation of the water from the oil, any waste absorbent material, such as sawdust, shavings, cotton and woollen waste, rice husks, &c., is employed. A very simple apparatus is used to complete the separation after the substances have passed through the mechanical rubbing apparatus. The peculiar property of the petroleum compound is such that the heavier portion is more readily absorbed by the dry material than the water. The consequence is that the oil and spirit will be absorbed first, and the water will remain unabsorbed, and flow out immediately through a waste-pipe; and the mixture thus formed is at once ready for the grate. The result is the production of a fuel which is stated to be equal in heat and endurance with the usual run of steam coal.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 241.)

THERE is scarcely the slightest feature in the condition of affairs on the Stock Exchange to distinguish the past week from the general run of its predecessors for some time past. All business of a speculative character was exceedingly limited; but still prices on the whole, bating a few exceptions here and there, maintained their position very fairly. Purchases for investment, however, continue their course in full swing, aided by the persistent cheapness and abundance of money, for which some employment must be found. The Gas Market has displayed rather more activity than it did the week before, and showed a marked disposition to increase in strength. Everything dealt in realized very good figures; and numerous advances in value are quoted, while in only one instance has a quotation receded. Debenture and preferred issues were specially in demand, owing to the general inquiry for gilt-edged securities already referred to; and several of these could only be obtained by giving higher prices. The Metropolitan Companies increased in favour. Gaslight "A" was steadily dealt in every day; the price never rising or falling more than a fraction above or below 227. Several of the secured issues made further moderate advances in value. At the Company's meeting on Friday nothing transpired which in any way affected the market in their stocks. South Metropolitan issues were pretty brisk all the week; and there is no cessation to the steady demand for them. The "B" and the debenture have mounted a step higher. Commercials also have advanced their figures for the old stock and the debentures. The Suburban and Provincial Companies have been exceptionally quiet; but they follow well after the Metropolitans in point of improvement. Of the Continental undertakings, Imperial was put down 1 from the position it had been advanced to the previous week, but was very steady at the corrected quotation. Nothing was done in Europeans; but a few deals in Continental Union showed that the price was still on the rise. There was no particular feature revealed in the transactions in undertakings in the remoter portions of the globe. The Water Companies have for some time past scored such large gains, that a temporary check was only among the most assured of probabilities in the immediate future. However, little harm was done; a slight retrogression in Lambeth and Southwark being all that was perceptible.

The daily operations were: The Gas Market opened strong, and, though not very active, somewhat improved its position as the day went on. Gaslight 10 per cent. preferences gained 1; the 6 per cent. preference, 1½; and South Metropolitan "B," 1. Progress was resumed on Tuesday, when Commercial old and the debentures advanced 2 each. Wednesday's business was somewhat limited; but the advance in value was continued. South Metropolitan debenture rose 1; Alliance and Dublin old, 1; and ditto new, ½. Southwark Water fell 1. Transactions on Thursday also were restricted; and quotations did not move. Friday's position was similar; and stocks remained very firm at the old figures. There was a little retrogression in Water; Lambeth and Southwark falling 1 each. Saturday was extremely active. The general strength was well maintained all round; while Gaslight "H" improved.

ELECTRIC LIGHTING MEMORANDA.

Electric Meters at Bath and Elsewhere—A Cruel Disappointment—Are the Registrations of Electrical Meters Conclusive Evidence?

IN another column will be found an account of the results that have attended the introduction of a meter system by the Bath Electric Lighting Company, in substitution for the contract system upon which the Company's business was based up to last Michaelmas. It appears, from the statements of consumers published in the local newspapers, that the Christmas bills showed a heavy increase upon the charges which the patrons of the Company have been accustomed to pay; and this notwithstanding the circumstance that the price per unit is only 6d., and therefore comparatively low. The former contract price was after the rate of 6s. per annum for a 10-candle power lamp, which was cheaper than any similar service in the kingdom. There is small doubt that the Company discovered their mistake in fixing such a low rate, and introduced the meter system in the hope of increasing their revenue; but the effort has evidently been a little too successful. An electrical contemporary remarks that it would have been more judicious for the Company to have made the change at the commencement of a summer instead of a winter quarter, so as to bring the consumers "gradually up to the fence." The figure employed in this comment is significant. We allude to the incident here not so much for its intrinsic importance, which is little enough, as for the purpose of pointing out how essentially uneconomical a system of private lighting by contract must be. Quantitative measurement is the fundamental condition of commercial success in all such businesses; and the electric meters in use at Bath and elsewhere, if not all that could be desired, at least fulfil the primary purpose of showing users of

electric lamps what they are about. Indeed, as the Chairman of the St. James's and Pall Mall Company told the shareholders at the recent general meeting of the Company, the consumers in this district have learnt to be so economical in the use of their lamps that the revenue of the undertaking did not increase last year at the anticipated rate. This circumstance, wisely regarded, should be very satisfactory to the Company; for a prudent and economical consumer, as gas companies long ago discovered, is a better customer than a wasteful one.

A funny story, illustrating the "irony of Fate," is told by the Australian correspondent of the *Electrical Review*, and we are delighted to add it to our collection of tales of a similar kind, in which the "malignity of matter" has manifested itself, to the discomfiture of over-confident electricians. It appears that a great professional and social function was arranged for a certain night at the town of Redfern; the occasion being the lighting-up of the first business establishment to take a supply of electricity from the central station recently established in the town. The Mayor, and a numerous company of local notables, among whom were probably numbered many who came with a view of becoming customers of the Company if all went satisfactorily, attended to witness the inaugural ceremonies. There were a number of dramatic accessories provided, with a view to enhance the impressiveness of the occasion, including a brass band; and the gas was solemnly extinguished to the strains of the Dead March in *Saul*, as a poetic farewell to the "light of other days." The electric lamps were then turned on, to a great flourish of trumpets; the band afterwards playing "See, the Conquering Hero Comes." The Mayor then delivered an oration explaining how efficient and economical the new light was, and said what a splendid effect it gave, and how it never went out, and so on. "The owner of the establishment then followed suit, and stated how pleased he was with the whole affair, and advised his fellow-townsmen to follow his example; and just as everyone was telling somebody else what a grand invention the electric light was, out went the light, and nothing would induce it to come on again." Naturally, the effect was somewhat depressing; but equally naturally it was explained that there was nothing wrong with the central station or the system. A fuse had broken down, or the wiring was defective; and the Mayor gallantly came to the rescue and invited the whole party to the Town Hall, where, he said, "he would show them what electric light is." The invitation was accepted, and a general move was made to the Town Hall, where "the lighting was just commencing to be much admired, when once more a main fuse went, and once more there was an oppressive silence." It is interesting to learn that the electric light keeps its little idiosyncrasies intact on the other side of the globe.

A rather important electricity meter case was recently decided at the Westminster County Court. The Metropolitan Electric Light Company sued a consumer for the amount of an account for electricity supplied; the quantity charged for being that registered by the consumer's meter. The account was disputed, on the ground that the quantity of electricity charged for was more than had been consumed. The plaintiffs pleaded that, under their Act of Parliament, the meter registration was conclusive evidence on this head; and judgment was given for them for the amount claimed, with costs. This is so far satisfactory; but the matter can hardly have been decided wholly upon the ground as reported. Gas companies are familiar with the phenomenon of the consumer whose meter registers more gas than he thinks he ought to pay for; and the question of the sufficiency of the meter registration as evidence of the quantity of gas passed has been raised more than once in Courts of Summary Jurisdiction. In these cases, it is usually held that the condition of the meter index is *primâ facie* evidence of the quantity of gas passed through the instrument, and that the onus of proving the contrary rests upon the party who happens to be dissatisfied with the registration. It can hardly be that the attribute of infallibility before the law which is denied to gas-meters has been conferred upon meters for electricity. Or does the case in point mean that it is easier to satisfy a County Court Judge that an account rendered for goods supplied is correct, than it is to carry conviction to the mind of a Magistrate in regard to a commercial matter—he being more commonly engaged in dealing with criminal cases in which a merciful usage gives the accused the benefit of any flaw that may appear in the indictment? However this may be, we should advise electricians not to trust too implicitly to meter indices when they have to proceed against recalcitrant consumers.

Paris Gas Company.—The revenue of the Paris Gas Company from the supply of gas for the past year shows a falling off to the extent of 66,264 frs. as compared with that for the year 1891. The totals for the two periods were 79,606,949 frs. and 79,540,685 frs. respectively.

Messrs. Richmond and Co., Limited, of Warrington and London, have issued further shares and debentures; raising the Company's paid-up capital from £15,000 to £23,000. The following gentlemen have also joined the Board: Mr. Thomas Dwerryhouse (Managing-Director of Messrs. Peter Stubbs and Co., Limited, of Sheffield and Warrington); Mr. W. D. Jeans (of Messrs. Jeans and Morgan, of Warrington and Manchester); and Mr. J. Coxon (of Messrs. Reynolds and Co., of Latchford); making up the directorate to six.

SIR THOMAS FARRER ON WORK AND WAGES.

In last week's issue of the Journal we gave some consideration to certain evidences supplied by contemporary literature of the manner in which established ideas and principles in regard to Political Economy and Sociology are now being reinvestigated with a view to their reform. There are many other pieces of evidence to the same effect, which would well repay study; but, for the present, it will only be necessary to mention one more—the action of the London County Council with respect to the rate of wages payable to unskilled workmen. The Council is a typical body, inasmuch as it exhibits in the highest degree the influence of those socialistic ideas on the subject of employment which are held by some of its most prominent, and, after a manner, influential members. And these very men—Tillett, Webb, Burns, and their kind—take great pains to carry into other parts of the kingdom the notions they uphold and act upon in the Council. It is therefore of general interest to note what they do in these matters, such as the payment of the employees of the Council, where they are able to carry out, at the ratepayers' expense, the notions for which they are accustomed to arouse the enthusiasm of mass meetings.

The question of how the rate of wages is arrived at in any particular employment is of high—indeed, the highest—importance; but it is one upon which there is no common agreement. As a matter of fact, it may be understood that the usual rate of pay for unskilled, but efficient labour in the London or any other district at a given period is (say) 5d. per hour; but it would puzzle most employers and labourers to explain why this should be so. A time may come when it is difficult if not impossible to obtain similar labour in the same district for less than 6d. per hour; and then this becomes the standard rate. The old school of economists would have explained this phenomenon by invoking the hyphothesis of a law of supply and demand; and they would have said that it was as natural for labour to command a price of 6d. an hour in some places and under certain conditions as for it to accept 4d. an hour elsewhere and under other conditions. And even at the same time and in the same place the old Political Economy would have seen no wrong in different men being paid different rates of wages, according to the estimated value of their labour.

All this is contrary to the spirit of which the so-called Progressist majority of the London County Council is the most powerful and important representative in British Municipalism. The Progressist—that is to say, the Socialistic—opinion respecting wages is that the employer is able to pay anything the workman asks, and that all wage-earners should share and share alike. And consequently, though insidiously and in detail, the working majority of the Council proceeded to apply to the employees of that body the principles which it is their pride and glory, as Socialists, to hold. Without bringing the matter forward in a general way, so that the Council as a whole could see which way they were being led, the different Committees made a number of recommendations aiming at the establishment of the 48-hour week and 6d. an hour as the standard conditions of employment of unskilled labour under the Council. This course of operations and its results are narrated by Sir Thomas Farrer, in a memorandum entitled "The London County Council's Wages Bill—Market Rate or Fancy Rate," which has been published at the price of a penny, and is intended to display the errors of the Council in the full glare of the light of Economic Science. This pamphlet is deserving of wide circulation; and we shall not be rating it too highly in characterizing it as one of the best pieces of work that even Sir Thomas Farrer can be credited with throughout his long and useful career in the public service.

The first effect of the action of the Council was the production of a widespread discontent among those who were supposed to benefit from it; and this feeling manifested itself in the conventional shape of the formation of a Trade Union of County Council Labourers. This Union held meetings, at which a member of the Council presided, and ultimately formulated a "Union scale" of wages. Meanwhile, the Council had adopted the principle that, in all their dealings with labour, the scale of wages should be that approved of by the Trades Unions interested; and so here we have the curious result of a Trades Union, composed not of followers of any particular "trade," in the usual acceptation of the term, but merely of men in a common employment, presuming to dictate their own rate of pay, and actually getting the presumption accepted by their employers. This sort of thing is encouraged by the published remarks of members of the Council. It was only the other day that, upon a question of the wages to be paid to the caretakers of a portion of the public property, Mr. John Burns made a clap-trap speech in which he denounced the inconsistency of those who objected to raising the wages of a labourer 2s. per week, and yet made no obstacle to the appointment of a Superintendent of Labourers at a salary of £700 a year. The trifling circumstance that the increased wages amount in the aggregate to many thousands of pounds yearly did not enter into the argument.

"There is a notion abroad," says Sir Thomas Farrer, "arising probably out of the state of things in which workmen generally have been forced to combine in order to obtain a fair share of the produce of their own industry, that there is some unlimited

fund, called capital or capitalized property, out of which all wages may be indefinitely raised if only workmen will all combine to raise them—a sort of cistern of infinite capacity out of which any quantity may be drawn, by an infinite number of taps, without exhausting it or even lowering its level. No dream can be more baseless. Some margin of profit there often is upon which labour may safely draw; some fixed capital there is which may for a time bear drafts on it without being exhausted. It is the difficulty of ascertaining this margin which renders it almost impossible for outsiders to form sound judgments on the merits of most strikes and disputes about wages; and those who have most experience will be very cautious in paying too much attention to the outcries of frightened capital. But there is no such thing as an inexhaustible fund out of which to pay wages. The fund out of which wages as well as profits are paid is the constantly accruing produce of industry; and it is only by increasing this produce, that wages can be increased all round. Further, any excessive demand on this fund by any one class of work and workmen must diminish the share of it which other classes would otherwise get, either by making the produce of their own labour dearer, and thus lowering real wages, or by exhausting the fund, and thus lowering money wages as well, or by both processes." The Duke of Argyll has very much the same thing to say about the hypothetical wages fund in his recent book; but the palm for clearness of expression belongs to the author of the foregoing sentences.

Sir Thomas Farrer elaborated his views upon the same subject in his evidence before the Labour Commission on the 27th ult. For JOURNAL readers, the most significant portions of this further declaration by the ex-Secretary to the Board of Trade are the observations which bore upon the probable consequences of the transfer to the County Council of those vast supply undertakings which the ambition of the Council is set upon acquiring—the water and gas undertakings, and others. Sir Thomas has hitherto been an enthusiastic advocate of the acquisition of the water supply by the Council. But he now says that the attitude of the Council on the question of wages has "considerably damped his ardour," and he is now "almost inclined to think with Sir John Lubbock that the water should remain in the hands of the Companies." This change of opinion on the part of Sir Thomas Farrer is due entirely to the fear lest any economies which might be effected through the transfer of the water undertakings to the Council might be more than counteracted by an increased labour bill. And what is said upon this head with regard to the water supply would, of course, apply with tenfold force to the gas undertakings. In short, Sir Thomas Farrer profoundly distrusts the County Council in regard to the wages question; for as he says: "When the question of wages is raised in the Council, it is always thrown in their teeth that they are paying somebody or other £500 or £1000 a year." Asked by the Duke of Devonshire whether this did not mean that the Council are as much disposed to underpay brain work as to overpay muscle work, Sir Thomas replied that this is so, and that "it led to even greater waste."

Here we encounter the old grievance of professional men against democratic governing bodies. Composed largely of small men, they have a dread of engaging big men in their service, and this wholly irrespective of the magnitude of the interests confided to their care. Moreover, Sir Thomas Farrer told the Commission that public bodies do not, as a rule, get their employees to rise to their best level; and that, in his opinion, the evil to be feared from municipal employment is not so much the increase of wages as the slackening of endeavour. This point was put to the witness by Professor Marshall, and he accepted it, with the additional emphasis that, while "it may be both, the latter evil is most to be feared." Finally, Sir Thomas Farrer put the finishing stroke to the demolition of Mr. Tom Mann's proposal for municipalizing the London docks by recalling the fact that, when he first went to the Board of Trade, "the question was how to take docks and harbours out of the hands of councils and like authorities, and place them in the hands of those who represent the trade," and knew how to work them commercially. So true it is that many of the newest fads are repetitions of exploded ideas.

Sir Thomas Farrer is to be thanked, in the name of the public, for the fresh force he has imparted to the fundamental question of what is expedient in regard to the administration of gas and water supply. It is this phrase which defends the preamble of all Bills in Parliament dealing with gas and water undertakings; and it looks as if this consideration will prove more and more formidable to a local authority that, with boundless ambition, has formed "a growing habit" of adopting "principles of extreme importance upon reports which contain very little information concerning the particular cases they deal with, and no discussion whatever of the principles they involve." The indictment is grave, especially coming from so competent a judge.

Received.—"The Comparative Merits of Various Systems of Car Lighting," by A. M. Wellington, W. B. D. Penniman, and C. W. Baker. New York: *Engineering News* Publishing Company. "House Lighting by Electricity," by Angelo Fahie, M.Inst.C.E. London: E. and F. N. Spon. "The Meteorology of Nottingham for the Year 1892," by A. Brown, M.Inst.C.E., and Philip Boobbyer, M.B.

NOTES.

The Behaviour of Iron Columns Exposed to Fire and Water.

Herr R. Luchmann has communicated to the German Society of Engineers and Achitects the results of some experiments carried on by himself with a view to ascertain the effects of exposure to high temperatures upon cast and wrought iron columns. The samples tested were 1 metre and 2 metres in length, with rounded ends, and were mostly hollow. They averaged nearly 6 inches in diameter and § inch thick. One of the specimen columns was first tested cold, and failed under a compression of 113,400 lbs. per square inch—one side breaking by tension. A similar column was heated red hot on the under side (all the columns were tested in the horizontal position) and when below 100,000 lbs. pressure, it was drenched with cold water for 2½ minutes, and once more heated. After the lapse of 36 minutes, the cold water was again applied. The column then failed at a load of between 16,000 lbs. and 18,000 lbs. per square inch of section; bending upwards and tearing across on the upper side. A wrought-iron column of the same dimensions was put under compression and made red hot on one side after 16 minutes. Water was then applied for 3 minutes, after which the column was found to have bent 0·57 inch. It failed under a pressure of 13,600 lbs. per square inch. A column filled with mortar had its resistance to destruction at a red heat increased to 26,400 lbs. per square inch. Another test showed that a cast-iron column exposed to a high temperature would receive great additional strength from the presence inside of a wrought-iron tube. Considerable benefit was derived from coating the columns with mortar, although this was liable to peel off upon heating and suddenly cooling with water. A remarkable result of the tests was the absence of any cracking of the cast-iron columns, which might have been anticipated from the treatment they received.

The Minimum of Visible Illumination.

M. Charles Henry has made some further communications to the French Academy respecting his zinc sulphide phosphorescence photometer, and certain results obtained by its use. With regard to the minimum perceptible amount of light, for instance, which was estimated by Aubert at about 1-300th part of the light of the full moon, M. Henry states that this valuation is about 1000 times too great. The minimum perceptible amount of light was determined by M. Henry by noticing the time at which the eye, previously kept in the dark for one hour, could only just distinguish the light emitted by the phosphorescent substance in his photometer; care being taken to test for illusions by the successive interposition of ground-glass screens. The time thus found was four hours; and calculating out the rate for loss of light by the zinc sulphide during this time, it was ascertained that the amount of light could be expressed by the term 29×10^{-9} standard candles at 1 metre distance. If the eye is previously kept in the dark during varying periods, the minimum is found to vary inversely as the square of the time during which it is so kept dark. As to the use of the phosphorescent zinc sulphide, considered as a photometric standard, careful tests are reported to show that the light emitted by it at a given instant is independent of the distance of the illuminating magnesium ribbon used to excite it, of the time of this illumination, and of the thickness of the layer of material, and is also uniform in samples prepared under different conditions; all the necessary requisites of a secondary photometric standard being thus exhibited by the new preparation.

Chemical Nomenclature and Spelling.

The divergencies of style in regard to chemical nomenclature and spelling which appear in different technical publications, are a source of some perplexity and no little vexation to both writers and readers; while the confusion created in printing establishments by this diversity of practice must be experienced to be appreciated. We have hitherto adhered in the JOURNAL to the old-fashioned terms and spelling; and we shall probably continue to print sulphate of ammonia and carbonic oxide for the full names of these compounds until the chemical and industrial world agrees upon some more appropriate terms in substitution for them. Unfortunately, confusion in this respect has been recently increased by the high-handed proceedings of the United States Bureau of Education, which has issued new rules for spelling chemical terms, for use in schools and colleges under its direction. The most important changes sought to be introduced by this order are, first, the dropping of the terminal *e* in all names ending in *ine* and *ide*, except those of doubly-saturated hydrocarbons; and correspondingly shortening the pronunciation of the vowel in the terminal syllable (*e.g.*, chlorin for chlorine, and oxid for oxide). Secondly, the substitution of the simple *f* for the diagraph *ph* in sulphur and its derivatives sulphate, sulphite, sulphocyanide, &c. Thus, sulphate of ammonia become sulfate; but why phosphorus is not similarly converted into fosforus is not stated. It is hardly necessary to say that we shall be no parties to these tricks with the spelling of English, or what purports to be English. If the Government and people of the United States want a language of their own, they may doubtless obtain something in this line eventually by continuing to make their own spelling; but it will only be a kind of "pidgin English" after all.

The Discharge of Steam-Jets.

In a variety of mechanical processes, among which the smokeless firing of boiler and other furnaces is included, the use of steam-jets is an essential feature; and there is often a question as to the amount of steam passed by such jets. It is remarked by the *Engineering Record* that the lack of a good form of steam-meter is greatly felt in connection with the employment of steam-jets, since an appliance of this kind would obviate the inaccuracies of the methods commonly employed in determining the quantity of steam discharged in this way. It is remarked that several years ago Mr. Charles E. Emery, of New York, a well-known authority upon steam heating, proposed a number of empirical formulæ to be used in calculating the discharge of steam-jets. The formulæ are based upon an extensive experience, and are presumably reasonably close approximations to correct data. It is assumed that the jets discharge against atmospheric pressure. Let d be the diameter of the circular jet in inches, and N be the weight of steam discharged in pounds. Then we have $N = 1216\ d^2$ for a steam pressure of 15 lbs. per square inch; the coefficient changing to 1804 for a steam pressure of 45 lbs. per square inch, and to 1978 for a pressure of 60 lbs. per square inch. These are the average pressures at which boilers are most commonly worked in practice. In cases where doubt as to the working pressure exists, Mr. Emery remarks that it is well to take the higher coefficient, so as to be on the safe side.

TECHNICAL RECORD.

THE INCORPORATED INSTITUTION OF GAS ENGINEERS.

In compliance with the rules, the Annual General Meeting of this Institution was held last Saturday, at the Offices, No. 11, Victoria Street, Westminster—the PRESIDENT (Mr. Charles Hunt, M.Inst.C.E., of Birmingham) in the chair.

MINUTES OF MEETINGS.

The SECRETARY (Mr. T. Cole) read the minutes of the annual meeting held in February last year, and of the adjourned meeting in May; and they were confirmed.

ELECTION OF OFFICE-BEARERS, MEMBERS, AND ASSOCIATES.

At the request of the PRESIDENT, the Scrutineers (Messrs. A. C. M'Minn, J. Tysoe, and H. Jago) then retired to examine the ballot-lists for the election of office-bearers and members. On their return,

Mr. M'MINN reported that the following gentlemen had been duly elected to the various offices:—

President—Mr. John Methven, of Beckton.
Vice-President—Mr. William Foulis, of Glasgow.
Members of Council—Mr. T. B. Ball, of Rochdale; Mr. W. Hardie, jun., of North Shields; and Mr. Henry Peaty, of Burslem.
Auditors—Mr. Magnus Ohren and Mr. Alfred Lass.

The gentlemen nominated as members and associates had also been elected, as follows:—

MEMBERS.

Ahlsell, Adolf Ludwig, Engineer, Gas-Works, Stockholm.
Baker, H. E. S., Engineer, Gas-Works, Reading.
Cranmer, Job Seymour, Engineer, Gas-Works, Stratford-on-Avon.
Cripps, Frederick S., Engineer, High Street, Sutton.
Dougall, Archibald, Engineer, Gas-Works, Kidderminster.
Harman, Edward A., Engineer, Gas-Works, Swan Village, Birmingham.
Herring, Walter Ralph, Engineer, Gas-Works, Huddersfield.
Marshall, Frederick Deacon, Engineer, Gas-Works, Copenhagen.
Nixon, Thomas Henry, Assistant-Engineer, Gas-Works, Old Kent Road.
Pihl, Olaf, Engineer, Gas-Works, Christiania.
Reeves, J. S., Manager and Secretary, Gas-Works, Bilston.

ASSOCIATES.

Clayton, Henry E., Assistant-Engineer, Gas-Works, Leicester.
Cooke, Adam, Manager, Gas-Works, Oldbury.
Woodall, Henry, Assistant-Engineer, Windsor Street Gas-Works, Birmingham.

On the proposition of the PRESIDENT, seconded by Mr. METHVEN, the Scrutineers' report was adopted.

The PRESIDENT remarked that this concluded the business; and the meeting would be adjourned until the 10th of May, at the Institution of Civil Engineers.

SOCIETY OF ENGINEERS.

Presidential Address of Mr. W. A. Valon.

At the opening Meeting for the present session of the above Society, which took place last night at the Westminster Town Hall, the PRESIDENT (Mr. W. A. Valon, of Ramsgate) delivered his Inaugural Address, the principal portions of which as far as our readers are concerned, are given below.

Gentlemen,—The rapid development of the principles of engineering science, conducing as it does to the health, wealth, and longevity of the human race, cannot but be gratifying to all; and although the colossal achievements of eminent men for the time astonish the world, the every-day questions of water supply, sanitation, gas supply, the application of electricity, general municipal work, and the education of our young engineers, must hold the field in interest with the general public as with ourselves. In addressing you, therefore, it will be my endeavour to present to you some of these subjects for consideration—although it must necessarily be only the fringe of them we can possibly touch.

Without attempting to enter into the vexed question whether the responsibilities attending water supply are better discharged by municipal authorities or companies, we may glance at the work of both, and form our opinions in accordance with the facts. The great city, in a part of which our present meeting is held, had until recently but little interest in a question of this kind; for no practical result could be the outcome of its discussion. But the advent of the County Council has in a measure cleared the ground for, if proved desirable, the united action of the entire Metropolis; and, although no doubt the present power of the Council is insufficient to allow it to adequately deal with the question—seeing that some of the out-districts, as well as the central Corporation, are not under its jurisdiction—nevertheless, so much of the Metropolitan area being already under its control, may in the near future justify the extension of its power, so as to place it in a position to undertake the serious responsibility of the control of the supply of water to such an immense district as London and its suburbs. In any case, the foremost question for decision, interesting alike to the consumer, the Companies, and the Council, is the course that should be followed in providing for future requirements. Without attempting to discuss or criticize well-known proposals, profit may be derived from a consideration of suggestions the result of observation and experience.

As is well known, the entire supply of the Metropolis is at present undertaken by Companies acting under restrictions and statutory powers conferred by sundry Acts of Parliament. About half of the supply is obtained from the Thames, the rest being principally supplied by the Lea and New River, and by underground waters made available by pumping. The last-mentioned source—the underground waters—is to my mind the undeveloped, and at present neglected means by which much may be done to improve the present, as well as efficiently provide for the future, supply. Knowledge on this important subject has advanced rapidly during the last two or three decades—due principally to the vast development of railway communication, and the construction of the various lines in and about London, as well as the country surrounding. Thus, the London, Chatham, and Dover line, with which some of us are well acquainted, begins in the London clay and terminates in the chalk, passing through the weald clay at a low level in its course. Other lines converging on London traverse the whole of the beds of the London basin; and their construction has afforded valuable information on the underground waters surrounding the Metropolis. There seems, however, more a tendency to annex a lake in some distant county, to supplement or supersede our present river supply, than to utilize these sources of pure water close at hand. It will not be necessary for my present purpose to describe minutely the geological formation surrounding the Metropolis, nor to trace the lines of disturbance. If we but bear in mind that the tertiary lies in divisions around London, north, south, east, and west; that the principal line of disturbance follows these divisions; and that the Metropolis itself stands at the south-east part of the north-western corner—it will give us a tolerably clear conception of its position, and convey to us that it does not stand in unbroken underground communication with the tertiary strata surrounding it. There are other lines of disturbance, the elevation or depression of which must have an important bearing on this subject when considered in detail; but for the present, we may with this knowledge assume these, and proceed.

Mr. William Morris, M.Inst.C.E., has courteously furnished information which enables me to say that the present limits of the Kent Water Company's supply extend over a total area of 178 miles; but about 30 square miles only is within the London district, the remainder being in the county of Kent. The original supply for the district was taken from the River Ravensbourne at Deptford, the undertaking being called the Ravensbourne Water-Works. It will be understood from this, that at that time the original Company was not of very great magnitude. After the establishment of the Kent Water Company, the supply was continued from the River Ravensbourne until about the year 1855, when, the available flow proving insufficient, the Company supplemented it by sinking deep wells into the chalk on the site of their then existing works, which fortunately proved to be most favourably situated for this purpose. Finding the underground water to be of superior quality to that of the river, and more abundant in quantity, the river supply was in 1862 discarded, and the district wholly supplied from chalk wells. This supply is obtained from wells and borings in the chalk, fed by rainfall on the North Downs and chalk district lying between the Ravensbourne and the Thames. The chalk averages from 500 to 600 feet thick, and forms an immense underground reservoir, the overflow from which breaks out in numerous springs along the valleys of the Ravensbourne, the Cray, and the Darenth; whilst many springs flow directly into the lower Thames at Erith, Northfleet, and at other places, where the river runs across the chalk formation. The catchment area, including the chalk and other permeable strata which drain into it, is estimated at 110 square miles; and the rainfall on

this area ranges from 24 inches per annum in the Thames valley to 36 inches on the North Downs—the latter rising to an elevation of from 700 to 800 feet above the sea-level.

In 1869, the Royal Commission reported that there was a large area of chalk at the south and east of London—a reservoir which did not feed either the Lea or the Thames above Hampton, as it contained surplus waters finding their way by innumerable springs into the Thames below London. From this reservoir, in all probability, large quantities of water might be drawn. They had not complete data as to what the available quantity would be; but taking into consideration the fact that the existing wells of the Kent Company, which were few in number, were then supplying above 7 million gallons, and were said to be capable of yielding twice that amount, and that a further 10 million gallons could be obtained from the springs at Cray (a small district near Gravesend), they believed it to be a moderate estimate that, by means of proper works, an addition might be made from the source named of about 30 million gallons per day. This report stated further that it was possible a considerable quantity of water, soft and of good quality, might be obtained in the neighbourhood of London by means of artesian wells in the lower greensand; and that the wells in the chalk formed an important auxiliary supply, and they might no doubt be considerably increased in Kent without interfering with the springs and valleys above London. It is worthy of note also that the Government Commission on the Chemical Quality of the Water Supply to the Metropolis, in their report of 1851, referred to the supply from the chalk as "approaching nearest to the standard of all that is excellent in a town supply, worthy, if necessary, of the grandest efforts and works to procure and convey it; but the sources being near at hand, the water is obtainable without much difficulty or great expense." They added that, with such a noble application of the chalk spring water as the supply of the Metropolis, it would be a desecration to permit that water to be wasted. In 1874, the Rivers Pollution Commission reported that the chalk constituted magnificent underground reservoirs, in which vast volumes of water were not only rendered pure and kept pure, but stored and preserved at a uniform temperature of about 10° C. (50° Fahr.), so as to be cool and refreshing in summer and far removed from freezing point in winter. It would probably be impossible to devise, even regardless of expense, any artificial arrangement for the storeage of water that could secure more favourable conditions than that naturally and gratuitously afforded by the chalk; and there was reason to believe that the more that stratum was drawn upon for its abundant and excellent water, the better would its qualities as a storeage medium become.

The supply of such water to the Metropolis generally, either softened or unsoftened, would be a priceless boon; and would at once confer upon it absolute immunity from epidemics of cholera. There is no doubt that between London and the south, south-east, and south-west coasts there is an immense chalk area, which might be made to yield an almost illimitable quantity of pure water. It has been demonstrated that there are very large quantities of water escaping into the Thames from the chalk, the Thanet sand, and porous Woolwich and Reading beds, along a line from Deptford to the west, past Erith and Northfleet to Cliff on the east. Mr. Marlow, as far back as 1869, stated upon his experience in the construction of a local railway, and experiments conducted by himself and Mr. Anstead, that as much as 60 million gallons of water a day might be obtained from the chalk by an intercepting tunnel along the line above described. My observations coincide with his. My experience is such as to prove to me beyond doubt that intercepting tunnels in suitable positions at proper depths, made with care and attention, so as to prevent the escape of the chalk waters into the streams or sea, as the case may be, would be a source from which water in such abundant quantity, and of so good a quality, might be derived for the supply of the Metropolis and surrounding district, as to relieve us from any great anxiety and study of the question for a generation to come.

The question may be raised, How would the interception of this water affect the streams? The answer is, that there are no streams of any magnitude to be affected in the districts named; and if there were, it is doubtful whether their scouring power would be much, if at all, reduced in the upper regions, as the water does not crop out in very large bulk until it is relieved from the pressure of the impervious soils in the bed of the river, and until the chalk crops up to the surface, as it does when approaching the mouths of the streams at their junction with the sea. This objection is not tenable, however, where the water finds its way through the chalk into the bed of the sea, which we shall notice presently. Water must be abstracted from somewhere, whether that somewhere be Wales, Cumberland, or any other county; and the loss of potable waters in these and other counties, may at some future time be considered an irreparable calamity.

A glance at the diagram on the wall, will show that by far the greater portion of the rain which falls on a chalk formation having no impervious beds intervening, continues to descend through various fissures till arrested by the gault or clay beneath the chalk, filling the lower cavities and accumulating to the height necessary to force it through subterraneous passages communicating with the sea. Under such conditions, an enormous quantity of water finds its way to the sea through the shore-line, between the level of high and low tide, and in many places through the bed of the sea itself. Further, we find, where the ground is undulating, it is a characteristic of the chalk formations which are covered by light porous soils, that heavy rain falling on the sides of these comparatively steep hills rapidly disappears below the surface, percolating and gravitating until upheld by the saturation of the chalk. It then gathers in such force in the interstices, as to push its way through the sides of the hills, or descending into the valley, unites with the surface water to form streams. On the other hand, it will be understood that rain and moisture gathering on a clay soil is not absorbed; some is quickly returned into the atmosphere as vapour, part feeds the fields and trees, while the greater quantity drains off into rivers and streams. Hence the chief difference between a comparatively impervious soil, which results in the immediate formation of surface streams of greater or less magnitude, and that of the chalk formation which crops out close to the surface, without sufficient covering of top soil to intercept the rapid passage of moisture to the cells below. If to this is added its already noticed fissured condition, it follows that absorption will take place so quickly as to clearly account for the absence of streams of any magnitude over such formations; there being a very limited amount of surface water available for their supply. For the same reason, evaporation is to a great extent checked; the water finding its way through the light soil, and gathering on the lower beds of impervious soils until an enormous natural reservoir is formed, of such depth that it is always full up to the nearest point where the chalk communicates with the sea, and this point of communication for all practical purposes may be taken at the mean between high and low water mark. But the reasoning necessary to establish the foregoing facts, carries with it others which are of equal importance—viz., that, wherever the chalk assumes a hill form, or is built up at a higher level, surrounded by permeable soils, it naturally follows that, the zone of saturation being reached, it will discharge itself at any easier or more ready outlet than the sea-level. This will also to some extent account for the puzzling difference of height at which water is found standing in wells in the neighbourhood of London; as well as the more or less ease with which they can be lowered by continued pumping at elevations above sea-level.

The following particulars given by Mr. T. H. Martin, Engineer to the Barnet Water Company, are recorded as bearing on the above. The area of the district supplied by the Company is 46·7 square miles. The supply is obtained 164 feet below the surface, from deep wells sunk into the chalk. There is the pumping-station at New Barnet (Herts.), 213 feet above Ordnance datum, situated on the London clay, and within 4 miles in a north-westerly direction of the district of South Mimms, where the chalk crops out and extends for about 18 miles in an east, north-east, and northerly direction, partly covered by drift. The rainfall over this area averages 26·75 inches per annum. At New Barnet there are three wells connected by adits—No. 1, 191 feet deep; No. 2, 234 feet deep; and No. 3, 252 ft. 6 in. deep. The district varies greatly in character, a large portion of it being entirely agricultural, as shown by the estimated number of inhabited houses being 8402, while the area is 29,888 acres. The chalk through which the wells have been sunk and adits driven is porous, though moderately compact, no large fissures having been found; but the supply of water is abundant. The height, however, to which it rises by the cessation of pumping, has fallen considerably, in common with the whole of the wells within the London basin; showing that the line of saturation has been lowered through the continued drain upon the underground water. Still, Mr. Martin is of opinion that the abundant supply now obtained can be augmented as required. Swallow-holes exist at South Mimms, where the water runs direct into the chalk. They are said to take the rainfall of 20 square miles; but this has not been found to be quite correct. It is true in dry weather the stream of water wholly disappears at these swallow-holes; but in wet weather they are insufficient in capacity to take the whole body of water, and the greater part flows by into the Colne. It is doubtful whether the water that thus passes direct into the chalk flows towards the Lea or Colne; but in time of flood, the spring water at Amwell has been noticed to be turbid, thus indicating a somewhat direct communication between the spring and surface waters in a north-easterly direction towards the Lea.

The East London Water-Works Company, under the direction of their Engineer, Mr. W. B. Bryan, M.Inst.C.E., have executed, within the past six or seven years, very large works for obtaining water from the chalk formation. At Lea Bridge alone, they have driven nearly 7000 feet of heading. At Walthamstow, where works are in progress, about 700 feet have been driven; and at Waltham Abbey, about 600 feet. The results vary; but the Company's success has been very great. At Richmond, in Surrey, the Corporation are still actively pursuing the search for water, by tunnelling in the chalk at a depth of nearly 400 feet; and they have succeeded in cutting through several fairly good fissures. An inspection made a few weeks ago with Mr. W. B. Bryan, and the Borough Water Engineer, Mr. W. G. Peirce, one of your Vice-Presidents, resulted in a recommendation to the Corporation to pursue the excavations. Evidence was afterwards given at the Local Government Board Inquiry confirming this proposal; and it is believed a good supply of water will be found.

A description of the water supply taken from the chalk for a coast town, will furnish considerable evidence of the truth or error of many of the statements already made; and we have on the wall a diagram showing a section of the headings in the chalk, from which the town of Ramsgate derives its daily wants. This town, as is well known, fronts the sea at the south-east corner of Thanet, stretching for about 2½ miles inland. At this distance from the sea, there is a slight depression in the table-land named Whitehall; and it is here the principal pumping-station is erected, at an elevation of about 99 feet above sea-level and about 83 feet below the highest part of the surrounding country—the town of Ramsgate varying in its levels to the extent of 155 feet.

As will be seen by the diagram, the pumping-well is sunk to the level of mean water-mark; and headings are continued right and left in a north-westerly and south-easterly direction, cutting the fissures of chalk at right angles, which would allow the water to flow in and accumulate until the headings were full, if pumping operations did not go on in the meantime. The headings are not water-tight, the water being as free to flow out as to flow in. As a matter of fact, however, it gathers to a considerable height before passing out, the reason being the natural one—viz., that the continuity of the flow being disturbed by the open heading, it must gather sufficient strength before it can continue its onward course to the sea. This one heading is about a mile in length, and contains, when two-thirds full, a million gallons of water. It yields daily in the summer time about 800,000 gallons; and if emptied at night, refills in about ten hours. These headings are about to be extended in a south-westerly direction towards Minster, directly alongside the South Eastern Railway; the direction of this line crossing the fissures of chalk as nearly as possible at right angles. A section of the tunnels is shown; and it will be noticed by its benched shape, that it is possible to drive any distance without raising the level of the bottom. This simple contrivance surmounts what was at one time a serious difficulty in water-tunnelling. The nature of the chalk through which these headings are driven is of a varied character. For a limited distance, a close, solid, sandstone-like formation will obtain, after which for a distance will be chalk, so loosely piled together that it requires timber support to sustain the arched form of the roof; while adjoining this will occur that rock-like and fissured arrangement, through which the bulk of the water is conveyed to the cross cuttings. The gathering-ground for Ramsgate is a fairly large one, embracing more than half the area of the Isle of Thanet.

After careful study, one cannot but conclude that a sufficient quantity of water would be obtained from the district between London and the South Coast in a more or less direct line, and the coast east of this line, for the supply of a great part of the Metropolis, without injuriously affecting or materially diminishing existing streams. Indeed, the Cray, a tributary of the Darenth, is the only stream between London and Strood that has its rise in the chalk district; and it conveys a very small part of the rainfall into the Thames. Hence it is certain that the water of the district of the North Downs runs into the Thames between high and low water mark, proved by the shallow wells sunk in the shore-line from Woolwich to Gravesend, from which pure fresh water is drawn for the supply of shipping. An equal absence of surface drainage is to be observed between Strood, Herne Bay, Ramsgate, Dover, and Brighton; while at all these points copious floods of water escape into the sea, as also considerable quantities at the outcrop of the chalk at the foot of the Sevenoaks and Shoreham Hills. Taking the average annual rainfall at 25 inches on the North Down and the district east and west of the Medway which finally drains into the Thames, and the area of chalk exposed or covered by the usual permeable soil at 450 square miles, and allowing (say) one-third for evaporation, surface drainage, and vegetable absorption, this would leave a quantity equal to more than 600,000 gallons per mile per day to infiltrate. This would amount to a quantity of water available for this district alone of 270 million gallons per diem; and the fact is worth recording that careful estimation shows that the exposed superficial beds and surface of the chalk surrounding the Metropolis, including outliers of tertiaries, may be taken at 2100 square miles. If the percolation is estimated to be 10 inches per annum, this equals an addition to the water stored in the chalk of 840 million gallons per day.

In considering the subject of the water supply to the Metropolis as a whole, many important questions present themselves beyond that of the possible future source of supply. There can be no doubt that any supply of water to be satisfactory must be constant. This fact, although long ago recognized and accepted, is not yet an universal condition of the existing arrangements made by the Companies. Indeed, in 1870 the whole supply was practically intermittent; and at the moment of writing, little more than one-half the area supplied by the Water Companies can be said to be in a different position. This is perhaps one of the most irritating facts in connection with the supply given by the Companies, tending more to create dissatisfaction than any other. No doubt the Companies might at once comply with the demand for an entire constant service, if not restrained by a fear of greater waste—a fear by no means unnatural, when by the present system, on an average, nearly 33 gallons per head of the population passes through the mains, being more than double the quantity that is absolutely necessary for a full domestic supply including what is used for sanitary and manufacturing purposes. If this be so, one-half the water delivered into the mains is wasted, and serves no useful end, not even from a sanitary standpoint; indeed, the reverse. The enormous cost of gathering and distributing, together with capital to construct the necessary works, forms an item startling in dimensions; and it is clear in my opinion that but a fraction of the annual amount expended to raise and distribute this waste, would be required for the purpose of efficiently guarding against such waste by maintaining mains, services, and distributory apparatus in perfect and reliable order throughout. This is proved beyond doubt by the experience gained in provincial towns where any company or local authority have had the courage to pioneer the way of constant supply, giving to the inhabitants the inestimable advantage of preservation of health, with a decreased annual expenditure through economy in working; at the same time providing an unsleeping protection from damage to property by fire. The pressure maintained in the mains should at all times be constant and sufficient. Fire-engines would then be unnecessary; and each householder, if he pleases, could protect himself by having a fire-hydrant fixed immediately opposite his door, or directly on his premises, as the case may be.

The town of Ramsgate was one of the earliest to adopt a system of constant supply. In 1877 the then Water Company sold their undertaking to the Local Authority. At that time the supply was intermittent—indeed, it may be said very intermittent, the upper levels being entirely without water until quite late in the afternoon. These levels were reached by means of pumping against a weighted valve. The water could not rise to the overflow reservoir, which was itself situated at an elevation considerably below the highest level, until all the valves on mains supplying lower levels had been closed; and in this way, the pressure was allowed to gradually gather sufficient force to press the water against the weighted valve, and so supply the mains in the higher district. This was a crude and unsatisfactory method of procedure, and in case of fire was inconvenient as well as dangerous; but it served to hasten the constant supply. Immediately after the transfer of the works, instructions were given to proceed with the necessary works for the purpose of a constant supply. The headings were extended; mains and services overhauled; a brickwork tower, 60 feet high, constructed at the highest point, with a cast-iron tank 10 feet deep, holding a quarter of a million gallons; and a new pumping-main laid to connect it with the pumping-station, situate about a mile and a half inland. In 1879, the water was turned into the high reservoir; and during the week succeeding, all the mains in the town and district were brought under constant pressure, and have remained so ever since. Ramsgate being a hilly place, the system adopted was one of high and low service—the mains being joined together, but at certain points separated by valves. If necessary, these valves are opened, and the high connected to the low service for the time being.

So efficient has the supply proved itself that, although many fires have broken out during the last fourteen years, none have caused damage to any considerable extent. The firemen, who are well drilled and organized, are provided with a hand-barrow with flexible screw hose and a hydrant key; and with this simple arrangement are quickly on the spot, and in a few minutes fires, which under ordinary circumstances would cause grave mischief, are absolutely washed out. Contrast this with the costly arrangements and water-wasting system existing in London. The maintenance of divisional fire-stations, furnished with expensive machinery, which must be moved from place to place to the danger of life and interruption of ordinary traffic, and the enormous quantity of water unavoidably wasted by the temporary arrangements needed to supply these engines, when all has been done that skill can devise, will give but a tithe of the efficiency that can be obtained from a common cast-iron main of proper dimensions, kept under an unvarying head of water by the natural means of bulk at a higher point.

It seems to be accepted without question, by those who have not tried it, that the adoption of a constant supply means waste of a prohibitory kind. My experience does not point to any such conclusion—indeed, it controverts it. While the Water Company at Ramsgate were giving an imperfect intermittent supply, the consumption per fixed head of the population rose to over 32 gallons. In 1879, after the constant supply was first installed, sufficient time had not elapsed to allow the old mains and services to be completely overhauled, the only precaution resorted to being that all waste-pipes should be taken out of the cisterns, and warning-pipes substituted in their place. In the majority of cases, these waste-pipes had been directly connected to the soil pipes. The result was to bring down the consumption of water per head of the population from 32 to 25 gallons. This was subsequently further reduced, by a thorough overhaul of the mains and services and a proper system of valves, to 17 gallons per head, at which it has since remained, with a very slight alteration, for nearly fourteen years. In a season town like Ramsgate, great care is needed to accurately arrive at the water used per unit of the inhabitants. The winter population of 30,000 is for a considerable part of the summer increased to nearly 90,000; and at that time it is hardly necessary to say the consumption per fixed head of the population rises considerably, but nothing like in proportion

to the extra number of people supplied. This would seem to prove beyond doubt that ordinary waste from apparatus, &c., is more considerable than we give it credit for, seeing that so long as the number of mains, services, and apparatus for supplying water are not augmented, the increase of numbers taking their water for a time through existing apparatus, bears a proportion equal to one-third only of the quantity taken by the fixed population. That is to say, during the winter the water consumed for all purposes by the population of 30,000 is 17 gallons per head; and in the summer, when the population is increased to 90,000, the consumption equals 36 gallons per head of the fixed population of 30,000. This includes the additional water used for roads, sewer flushing, and gardens not required during the winter months.

This question of waste is a large one, in its effect reaching far into every phase of water supply; and it can only be by some determined and united effort on the part of water engineers that it will be conquered. The enormous expenditure incurred in raising, storing, and distributing this waste has already been referred to; the expenditure to dispose of it must be relatively as large, while the required capital to initiate and maintain works capable of either pumping or impounding this lost quantity, should certainly not be expended until the present supply is intelligently used. The system of inspection as ordinarily performed must be considered a failure. Improvements have from time to time been introduced into a faulty system; and some relief has followed—too often to be soon after neutralized by relaxed effort, caused by the confidence inspired by a first success, and the necessity for continued and untiring watchfulness, which in practice it is very difficult to efficiently maintain.

Some few years since, the Corporation of Ramsgate was called upon by the Rural Sanitary Authority to extend its mains a distance of six miles beyond the Municipal boundary; and, as the district referred to was within the limits of supply granted to the Corporation by the Act, they complied. After the work was completed, and as the services were in some number connected, the extreme difficulty of efficient inspection to a district wide of the centre was felt; the more so as many of the consumers were farmers, market gardeners, and so on, who at certain periods of the year had a use for water other than for domestic purposes, and used it accordingly—generally without leave. Efforts by the inspectors to check this unaccounted-for waste were not successful, and it was therefore thought advisable to supply these customers through a meter, under an agreement that so many thousand gallons as a maximum quantity should be allowed to each consumer, according to the amount at which his property was rated; an additional charge at the usual price per 1000 gallons for manufacturing purposes to be made for any quantity exceeding the maximum agreed upon. This plan was successful, saving labour and giving satisfaction to both supplier and user.

It is not claimed that the practical experiment just related fulfils all the conditions necessary to successfully supply water by meter, as circumstances would not justify its being applied to general purposes without the attendant rules being carefully thought out. The success it met with, however, may be taken as an indication of what might be a reliable way of dealing with this most difficult subject, if only surrounded by the necessary safeguards which would be insisted upon by Parliament apart from any economical reasons. Any attempt to present a Bill embodying the supply of water by meter, would receive scant favour from a Parliamentary Committee, unless, at the same time, it could be shown that for all useful purposes the supply would be practically unlimited, and that the cost of supply to the poor would be such as not to deter them from its ample and free use. It is my opinion that both these conditions may be fully complied with while measuring and regulating the supply by meter.

There are many and weighty reasons which can be, and are given for a continuance of the present method of levying a rate to provide payment for the supply of water, but perhaps the two most complete are: (1) The necessity that a plentiful supply at a low rate should be given to small properties or buildings inhabited by people in poor circumstances; and (2) that this is an equally essential condition to the "well-to-do," in order that the health of the whole community, rich and poor alike, may be protected, and not allowed to suffer from bad sanitation in any part of a connected district. It is not therefore proposed to interfere with the present mode of payment, so far as the rating of property for the water consumed is concerned; but by observation and calculation, it has been found that among houses, small and large, an estimated quantity at the rate of 10 gallons per room per day on an average to each tenement, leaves a large margin over and above what is required for all purposes of domestic supply.

Now if this quantity be taken as the basis of supply, a few figures will prove that, while it secures an ample quantity to cottages, small properties, and buildings occupied by the poorer classes, the larger mansions will be equally well cared for. It may be urged that in most towns in all crowded quarters there are to be found many tenements, large and small, where each room is occupied by from two to six persons, and that here the 10-gallon limit would not apply. But it is just such cases of overcrowding that would justify the regulation. Owners of this class of property are responsible for the water consumed by their tenants; and while the tenant would have no restriction to the free use of water, the extra payment demanded at the end of the quarter from the proprietor, would give him a greater interest in the habits of the occupiers of his premises, and perhaps lead him to give a more conscientious supervision of the duties he assumes as the possessor of house property—which may be a little troublesome, but is correspondingly profitable. If the quantity allowed were adjusted at the end of each quarter, and there had been no excess, no additional charge could be made; but if the maximum had been exceeded, then the additional quantity would be paid for at the rate charged for water per 1000 gallons for manufacturing purposes. This quarterly striking of the balance would leave no room for carelessness; and only a short discipline would be necessary to bring consumers in line with the system. Questions of detail, such as what area should be agreed as sufficient to be reckoned as a room, or, when a room was of very large area, whether it should be calculated as two or more, would easily be adjusted.

The difficult question, however, to which attention will next be called is the selection of a reliable measurer. It is not within the scope of my present intention to enter into the merits or demerits of any particular water-meter. My remarks will generally apply to the various classes of meters now competing for favour, each claiming, no doubt justly, many points of excellence; but it is just the intelligent appreciation of these particular points of excellence, in the division or class to which they belong, on which success in their use entirely depends. During the last 50 years, a thousand designs of one kind or another in the various classes of water-meters have seen the light. All of these can be grouped under one or other of the following heads: (1) Low-pressure meters; (2) inferential meters of various types; (3) positive meters of the reciprocating piston principle, with single and double cylinders; (4) diaphragm meters; and (5) rotary-piston meters. In each of these classes, there are manufactured meters having many good points and a few defects. It is impossible to say of any of them that they are perfect; but, given a fair knowledge of the construction of each kind, with a judicious selection of the meter best adapted to the work it has to perform, it will be found that practical accuracy in measurement will result.

In domestic supply our attention should be directed: (1) To the nature of the water to be dealt with; (2) if it is to be a constant or an intermittent supply; and (3) whether cisterns are to be wholly used, partly used, or completely cleared away, thus drawing the water direct from the main. These points being understood, the meter selected should be considered first in its relation to its efficiency for the work required of it, secondly as to the cost. But, having regard to these two latter considerations, the most suitable meter, which does its work most perfectly at the lowest cost, should undoubtedly be chosen. Great care is required to fix on any particular meter to give accurate results where there is a constant supply without cisterns, due to the loss of head at the outlet. But generally it will be found that the advantages offered by the best form of rotary piston for this kind of work, will put other classes at a disadvantage. Our experience in England with the domestic meter, is not of sufficient extent to allow a complete reference; but in America, where, if anywhere, water might be expected to be freely wasted, the domestic meter is in many places in full operation, giving satisfaction to both the company and consumer.

[The President then passed from the water question to that of sanitation; dealing successively with the questions of general drainage and the ventilation of house drains, connections, and subsidiary drains. He next alluded to the recent completion, after 20 years' reporting, of a system of sewerage for Margate. Other municipal works of considerable interest, which are in progress at Dover and Ramsgate, were next referred to. With regard to the latter town (which, as our readers are aware, is being furnished with a new sea-front from plans prepared by Mr. Valon), the President was able to supplement the remarks of his predecessor by the statement that what was this time last year only proposed, is now far advanced towards completion. The work from which most difficulty was apprehended (the construction of the new sea-wall across the inner harbour) has been carried to a successful issue. The works at Dover to which reference was made by the President, comprise extensive alterations in the harbour. The concluding portion of the address is given below.]

Noticing the work of the Society for the past year, it is a matter for congratulation that the papers contributed to the transactions were instructive in the best sense of the word—interesting discussion following the delivery of each. The subjects embraced "Electricity as a Motive Power applied to Traction and Hoisting Machinery," "Dry Crushing Machinery," "Sewage Precipitation Works," "The Cleansing and Ventilation of Sewer Pipes," "On the Use of Steel Needles in Tunnel Driving," and "On the Shortlands and Nunhead Railway." The latter we had an opportunity of inspecting last year during its construction. It is needless to more than refer to the titles of the papers, which are recorded principally to indicate the varied and useful class of subjects discussed during the year, which should be sufficient inducement to attract to the Society members from every department of civil and mechanical engineering. While it is gratifying to find that for 1892 the Society increased in numbers, let me impress upon you all the

advantage we gain from these increased numbers, and urge you to use personal efforts to introduce all those from among your friends who are qualified to join the Society.

My remarks will be closed by a few words offered to the younger members, on whom we depend as our followers in the application and development of the principles of engineering science. They are suggested by a review of the instructive visits made by the Society last year. The especial design of the Society has been to add to the better practical education of the younger members of the profession, by arranging visits to harbours, dockyards, bridges in course of construction, and locomotive works—indeed, the Council take advantage of all opportunities which enable them to offer to the members practical information and instruction.

It is true that careful preparation is necessary by all those who seek to follow the profession of an engineer; but it must be combined with sound practical knowledge, gained by observation and experience from the achievements of others. Sound education is absolutely necessary to secure success. Hence the obligation of strict attention to rudiments and first principles during the period of training. To be well acquainted with the elementary part of any subject, is to lay the sure foundation on which after-experience may be safely built; and frequent recurrence to first principles will save many weary hours of useless study. Let me therefore repeat, be careful to be well acquainted with the rudimentary part of your profession, which, if followed by close observation and good judgment, will bring its own reward. Experience most firmly proves that scientific research, and the result of that research developed in practice, should be kept entirely distinct. There is, however, no good reason why practical men should not become more scientific, and scientific men more practical. A recent writer says: "Those who maintain that the human intellect is still growing, point to the progress made by science during the last 2000 years, and ask could such progress have been made unless there had been an immense development of brain power?" In my opinion, the answer is: That it is not by the possession of finer brains that successive generations of men of science have made greater discoveries, but by the help afforded by the accumulation of experience which one generation leaves to another to work upon—thus enabling their successors, without one whit more brain development, to further advance along the road of progress. It is not required that the generation which comes to the task to-day should possess larger and better brain power than the past generation; the advantage lies in the inheritance of the experience acquired from those who have gone before. Further illustration cannot be wanted to press home the importance of the existence of a Society like this, which combines practical instruction with interchange of experience, as the only means by which men of observation can become useful or great. A book was put into my hands a few days since, published by Messrs. Cassell and Co., entitled "A Successful Life." The writer is anonymous, and calls himself "An Elder Brother." Few elder brethren could give better advice; and the book should be in the hands of all young men, especially those preparing for a professional career.

And now, gentlemen, though there is much more one would like to say to you, it must be reserved for a future occasion, and a conclusion made by heartily and sincerely thanking you for the honour you have conferred upon me in electing me your President—which is recognized as the highest honour you can bestow on any of your members; and in return, let me assure you that the continued prosperity of the Society during my year of office will be my anxious care.

[The address was illustrated by diagrams; and it was well received.]

THE LIGHTING ARRANGEMENTS OF THE HOUSES OF PARLIAMENT.

The opening of Parliament last Tuesday affords us an opportunity of referring to the lighting arrangements of the two Houses, which, as our readers are aware, have lately undergone considerable modification. Our enterprising contemporary *Industries* a few months ago devoted the larger part of a special number to an illustrated description of the engineering features of the Palace of Westminster; and to this source we are indebted for the following particulars:—

The chief illuminants employed at St. Stephens are gas and electricity, although oil and candles continue to be used in many parts of the building. When gas was first adopted, it was produced from cannel—its illuminating power being fixed at 28 candles; but it was afterwards lowered, and now ordinary 16-candle gas has been substituted. The principal place within the building in which gas is now employed is the House of Commons itself. In this case, lighting by gas has been found more successful than lighting by electricity, not only on account of the effect produced on the ventilation from the heat evolved by the combustion of a large quantity of gas above the ceiling of the chamber, but also from the superior diffusive quality of gas illumination as compared with electricity. Experiments conducted a few years ago demonstrated that, notwithstanding the superior local power of electric light, the "body" of gaslight gave a better result on the floor of the House—a distance of 45 feet from the source of light. The present mode of lighting is by 64 double-ring Argand burners each one of which is placed in the centre of each of the horizontal panels of the ceiling, which are composed of ground glass ornamented by a painted Tudor rose and foliage. The light is reflected downwards by means of iron concave reflectors painted with zinc white; while the products of combustion from each of the burners are carried away through an iron pipe 3 inches in diameter, and discharged into the uptake of a ventilating furnace placed over the lobby of the House of Commons. Immediately over the gas-burner, and between it and the flue-pipe, is placed a short chimney of clear well-annealed glass, in order that the light from the entire flame may be utilized. Beneath each of the glass panels a netting of fine wire is placed, so as to prevent accident from falling glass, should a panel become accidentally cracked. All the framing of the ceiling, which is of timber, is coated with asbestos paint; while that portion which is contiguous to the gas-burners is lined with sheet-lead as a protection from fire. The parts immediately surrounding the burners are composed of either metal or glass.

The consumption of gas in each burner is 21 cubic feet per hour. As the centre of the flame from these burners rises several inches above the under side of the ceiling beams, considerable shadows would ordinarily be thrown upon those panels forming the slope of the roof, and through which no light passes. In order, therefore, to prevent such shadows, and to illuminate every portion of the ceiling equally, ten pendants project into the chamber, each having suspended from its lower end a copper reflector, shaped to form a suitable terminal to the pendant; while inside the reflector, and concealed from view, is a small gas ring-burner. The reflected light from these burners being thrown both vertically and horizontally destroys all shadows caused by the general lighting being above the level of the ceiling panels. The products from these pendant burners are carried upwards through metal tubes placed within the pendants, and discharge into the ventilating furnace overhead. No products whatever from any of the gas-lights are allowed to enter the chamber; while the heat from the ceiling does not in any way affect the temperature beneath. This has been ascertained by suspending thermometers below the glass ceiling. The total consumption of gas required to light the chamber at the present reduced illuminating power is 1500 cubic feet of 16-candle gas per hour, as against 1200 cubic feet of cannel gas of 20-candle power which has of recent years been needed. Beneath the galleries, which extend the whole length of each side and also across the House at the Bar end, lights are placed in order that the general lighting from overhead—being interrupted by the projection of the galleries—may not cast a deep shadow upon the back rows of benches. These subsidiary lights, consisting of 32 8-candle incandescent electric lamps, are fitted within lanterns attached to the backs of the heads or capitals of the pillars supporting the galleries, and are out of view from the centre of the chamber.

Up to the end of last session, the chief illuminant in the House of Peers was gas; there being 10 ring-burners, each consuming 72 cubic feet of gas, placed at the ends of pendants projecting to a distance of 10 feet into the chamber from beneath the ceiling. The products from these burners were carried through tubes passing through the centres of the pendants, and conveyed to a ventilating furnace overhead. Provision was made in the recess for lighting the chamber by electricity; and the gas pendants have now been replaced by ten electroliers, each furnished with 36 incandescent lamps. These electroliers are suspended from above the ceiling by means of steel wire cords, which, running over a series of balance pulleys in conjunction with the electric leads carrying the current, permit of the electrolier being lowered for the renewal or adjustment of the lamps without any disconnection of the wires and consequent break of current. By this arrangement the lights are available at any distance from the ground within the 30 feet travel of the electrolier. This may prove a convenience during the sittings on appeal cases, when the attendance consists only of a few persons at the Bar end of the House. In addition to the general lighting of the chamber, there are placed upon the floor, on either side of the Throne, two massive and highly ornamented brass candelabra, each designed to receive 25 large candles, the topmost of which rises to a height of 18 feet above the floor. These candelabra are only occasionally used, as the ordinary lighting is generally considered to be sufficient.* As the peeresses' galleries on either side of the chamber do not extend to any great depth, and are unsupported by pillars, no additional lighting is necessary to counteract shadows. The division lobbies on either side of the House, also the peers' lobby and princes' chamber, are lighted by electricity; the two latter places by means of two massive electroliers, each furnished with 36 lamps in two sections, so that one-half only of the light may be used at pleasure. These electroliers, as well as all others of a similar character in St. Stephen's Hall, the Commons lobby, and other parts of the

* As a matter of fact, according to Mr. H. W. Lucy, of the *Daily News* (the Toby of *Punch*), the candles have not been lit since Earl Cairns left the Woolsack. "That eminent jurist," he says, "had a strong preference for candle light; and whenever, during his presidency, it was necessary to light up, he had matches applied to the candle wicks."—ED. J. G. L.

building, which are not readily accessible from the floor, are provided with lowering apparatus worked by worm gearing and drums, upon which the wire suspending-cords for sustaining the weight of the electrolier are wound; the leads being carried upon balance pulleys working between guide-rods, which, taking up the slack, keep the leads always taut. Some of the lighter electroliers are raised and lowered by balance pulleys alone; both the wire cords and the electric leads passing over the same pulleys, which are weighted to slightly overbalance the electrolier. In addition to a 36-light electrolier placed in its centre, the lobby of the House of Commons is illuminated by four 6-light electroliers placed at its corners; while the east and west doors leading from the lobby to the libraries and members' entrance respectively, and the principal entrance to the debating chamber, are each illuminated by a row of electric lamps concealed behind the stone mouldings of the doorways.

Experiments have from time to time been made for the purpose of ascertaining the relative merits of gas and electricity as an illuminant both for inside and outside lighting of the building. In the year 1873, a series of experiments were conducted under the superintendence of the Deputy-Master and the Engineer to the Corporation of the Trinity House, in order to determine upon the most efficient and convenient form of light for use as a signal during the sittings of the House of Commons. In a competition between an electric arc light—the current for which was supplied by one of the earlier forms of Gramme dynamos, a Serrin lamp being used within a fixed cylindrical lens—as against one of Mr. Wigham's triform gas-burners placed behind a reciprocating cylindrical lens, the gas was found to be superior to electricity, not only in point of distinctive illumination, but also on the score of convenience, more particularly in regard to its reliability and the slight amount of attention required in its maintenance. Further experiments were made in subsequent years as to the merits of arc lighting in the debating chamber of the House of Commons, the central hall, and in New Palace Yard. None of these, however, proved satisfactory. In the year 1883, it was decided by Mr. Shaw-Lefevre—who was then, as now, First Commissioner of Works—to test the system of incandescent lighting, and a small plant was installed within the building for the purpose of lighting the libraries and division lobbies of the House of Commons. The experiment having proved satisfactory, the plant was enlarged until the limit of space and power was reached. At the same time the demand for electrical energy kept increasing; and it became necessary either to replace the existing general plant by one of a much larger and more modern character, and necessarily locate it outside the building, or, as an alternative, to obtain a supply of current from one of the public electric light companies. The existing plant consists of two horizontal non-condensing engines, having cylinders 8 inches in diameter and 10-inch stroke, running at 330 revolutions per minute. The exhaust from these engines is open to the atmosphere through one of the ventilating-shafts in the Victoria Tower; but before it reaches the base of the shaft, the steam is condensed by means of a surface condenser supplied with circulating water from the Serpentine in Hyde Park. These engines drive three Edison dynamos at a speed of 850 revolutions; giving an output of 300 ampères at a voltage of 105. The dynamos, though now of a somewhat obsolete character, have proved themselves to be well constructed; their present condition showing, after nine years' wear, during which time they have had some long continuous runs, that special care had been taken not only in their manufacture, but also in their subsequent treatment. This plant being only capable of furnishing current to the extent of about one-fourth of the present demand, the major portion of the electric energy is supplied from the Millbank Street station of the Westminster Electric Supply Corporation, whence the main cables are conveyed beneath the surface of the ground across the Victoria Tower Gardens into the Houses of Parliament at the south end of the building. The main switchboard, which is situated at the junction of the Company's mains with those of the Houses of Parliament, is at present fitted with three 400-ampère switches—an electricity meter, on Dr. Aron's principle, and double-pole cut-outs being connected with each switch. After passing the meters and entering the Houses of Parliament system, the current is conducted by the main cables to distributing-boards situated in convenient centres for distribution by the local switches placed in the immediate neighbourhood of the lamps which they are intended to command, in order that the lighting attendant in charge of each section may see at once the effect produced upon the lamps, by altering the switches. Each of these minor switchboards has from 10 to 20 switches with double-pole cut-outs placed within an oak case furnished with a plate-glass door, which is kept locked. Each switch being neatly labelled by means of ivory tablets, it can be seen at a glance whether the current is "on" or "off" any particular place. The general lighting of all the halls, corridors, and rooms is controlled by these switches; but in certain cases, such as the suspended adjustable lamps over the desks and writing-tables in the Ministers', reporters', secretaries', and clerks' rooms, supplementary switches are provided for use by the occupants, in order that light may be obtained when desirable, and extinguished when no longer required, without the intervention of a lighting attendant; in all cases, however, the current is controlled at the local switchboard. The lighting is divided into three classes: (1) General lighting, which takes place on the decline of daylight due either to the setting of the sun, rain clouds, or fog; (2) day lighting, for use during the daytime where in some parts of the building there is an insufficiency of daylight; (3) night lighting, where lights are required to be maintained throughout the night after all business has ceased—the lights being extinguished at daybreak. The latter lights may be classed as safety lights; being not only indispensable to persons moving about the building, but also most valuable in case of an alarm of fire. The whole of the electric lighting installation has, we understand, been carried out by the permanent lighting staff of the Houses of Parliament, under the direction of the Chief Engineer.

A description of the lighting arrangements of the Houses of Parliament would be incomplete without some account of the signal-light on the clock tower. This, of course, was included in the article from which the foregoing has been taken; but as the old light, which did duty from 1874 down to the prorogation in August last, without a single failure, has been somewhat modified, we take the description of the new apparatus which appeared in our contemporary last Friday. It was furnished by the Resident Engineer (Mr. W. J. Prim). It will be remembered that the old light could only be seen on the western side of the tower through an arc of a circle of 210°, and consisted of two of Wigham's biform gas-burners, enclosed in a lantern, which was placed on wheels to allow it to be run out to one side of the tower at night, in order to indicate to members in the West-end clubs when the House was sitting. The new lantern, which is fixed in a chamber, open on all sides, at a height of 250 feet from the ground, contains a single burner, but is furnished with a second-order dioptric apparatus, consisting of a refracting belt, with top and bottom elements 820 mm. in height and 1 m. 40 mm. internal diameter, made of highly-polished glass. The burner, which is placed in the focus of the refracting belt, is a Wigham lighthouse burner of 68 jets, and was constructed by Messrs. Edmundson, Limited, of Dublin. The jets are so placed with regard to each other that, when drawn into shape by the overhanging iron flue, with talc terminal, a solid mass of flame, about 8 inches in diameter by 6 inches high, is produced, with a consumption of gas of about 240 cubic feet per hour, and having an illuminating power of 2400 candles, or about 10 candles per cubic foot of gas consumed per hour. By this arrangement, the light from the naked flame falls without any interruption upon every portion of the surface of the dioptric apparatus. The whole is enclosed within a glazed lantern 9 feet diameter and 12 feet high. As the lantern stands within the tower, and is practically invisible from the ground (the light being thrown through the opening between the stanchions supporting the spire), it is necessary to have a large body of light, so that the principal supports at the four corners of the tower may not seriously intercept, but allow of a beam of light being thrown throughout the entire circle. A bye-pass valve is arranged in addition to the main gas-valve, to allow access of a small quantity of gas to the burner when the burner is in full use. If deemed desirable, in order to make the signal more distinctive, a system of flashes can be readily imparted to the light by clockwork mechanism attached to the valve. The lamp, with the exception of the lens and burner, has been constructed and erected by the lighting staff of the Houses of Parliament, under the direction, and to the designs of, Mr. Prim.

The Bolton Water-Works Department.—The Water-Works Committee of the Bolton Corporation have appointed Mr. F. J. Swindlehurst (son of their Water Engineer), Assistant-Engineer to the department; Mr. A. Holden, who formerly filled the post, having received the appointment of Surveyor to the Hindley Local Board.

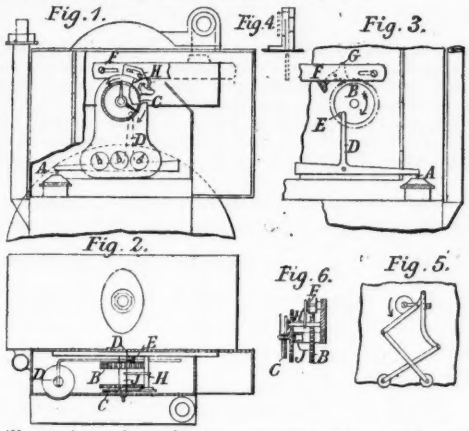
The Manurial Value of Gas-Lime.—The *Farmer*, writing upon this subject, says: "Gas-lime is good for all soils to which lime should be applied; and it is even preferable to other forms of lime for leguminous crops, to which the sulphur it contains appears to make it very beneficial. Gas-lime frequently contains appreciable quantities of nitrogen, which add greatly to its value. As the gas-lime must be exposed to the air for a considerable time before it can be used, it is a very good plan to make it into a compost with waste animal or vegetable matter."

A Regulator of the Secondary Air Supply for Generator Furnaces.—An apparatus for automatically controlling the supply of secondary air to generators is described by J. Hudler in the *Journal für Gasbeleuchtung*. He states that ordinarily the quantity of secondary air admitted is, from various causes, and particularly from atmospheric disturbances, very variable, and that consequently a uniform temperature cannot be maintained in the furnace. To remedy this evil, he places in the air-channel an apparatus designed to admit air at a regular rate. It consists of a plate, which is bent and immovable, and another, turning on its axis, which is so placed that sufficient space is left for the passage of air between the edge of the moveable and the angle of the fixed plate. An increase in the draught causes the moveable plate to turn and partially close the passage, and thus automatically control the supply of air. He proposes also to adapt this apparatus to serve as an indicator of the amount of draught, by fixing a pointer, playing over a graduated scale, to the axis of the moveable plate.

REGISTER OF PATENTS.

Prepayment Gas-Meters.—Thorpe, T., of Whitefield, Marsh, T. G., of Lytham, and Haynes, J., of Liverpool. No. 465; Jan. 9, 1892.

This invention relates to improvements in coin-freed or coin-actuated mechanism in connection with gas-meters, such as are described in patent No. 13,368 of 1891. The improvements have for their objects: (1) To render unnecessary additional valves to those incidental to, and usually employed in, ordinary wet gas-meters, for shutting off the gas when a proportionate quantity to the coins inserted has been delivered. (2) To enable persons interested to easily and readily ascertain the number of coins inserted. (3) To prevent bent coins, or coins which are too large or too thick, being inserted in the money-slot.



The illustrations show the improvements, along with such parts of the 1891 patent as are necessary to make the patent clearly understood. Fig. 1 is a front elevation, with parts broken away, of a wet meter, showing some of the improvements. Fig. 2 is a plan view, partly in section. Fig. 3 is a back view of a portion of the mechanism shown in figs. 1 and 2. Figs. 4 and 6 are sections of fig. 1. Fig. 5 is a plan view of part of the shutting-off mechanism employed in dry meters.

Between the limiting part (which, in wet meters, is simply a stud or projection) and the usual float-valve of the meter, is interposed a lever, pivoted to the apparatus, having one of its ends attached to a spindle A, which passes through a stuffing-box, mercurial or water seal, or the like, to the float-valve of the meter, and the vertical arm D engaging the limiting stud or projection E. When the ratchet-wheel B is rotated, by means of the pawl G (as described in the 1891 patent), the stud is removed from engagement with the vertical arm of the lever, which is then free to turn on its pivot, allowing the float-valve of the meter to be raised, and the gas to flow through, until the stud returns to the position shown in fig. 3, when the lever presses the spindle down on the valve and closes it, thereby stopping the further flow of gas through the meter. In the case of dry meters, the connecting of the limiting part of the stud with the usual float-valve is effected (as described in the 1891 patent) by a stop, which receives a rotary movement from the diaphragm or measuring chamber of the meter; and another of the present improvements consists in giving this stop a rocking movement, instead of a rotary one. This can be achieved in a variety of ways; for instance, the links (shown in fig. 5) may be extended, to one of which the stop is fixed, as shown, or a slotted and pivoted arm actuated by a stud on one or both of the connecting links may be used.

To enable persons interested to ascertain the number of coins inserted in the receptacle formed in the meter, there is loosely mounted on the sleeve J, carried by the ratchet-wheel B, a second ratchet-wheel C, which carries a pointer adapted to move in front of a dial—preferably the same dial which the pointer showing the quantity of gas to be consumed moves round. (The dial is left out of figs. 2 and 6 for clearness.) This pointer can be connected with a moving part of the mechanism in a variety of ways, according to the type of mechanism adopted for the other portion of the apparatus; but, as applied to the 1891 patent, the following method is suitable: The ratchet-wheel C is actuated by a pawl, which is again actuated by a stud or pin on the pawl-carrier F. The pin or stud fixed thereon engages a slotted plate H, which is attached to a rotatable spindle carrying the pawl. The pawl-carrier makes its full traverse, forward and back again, for each coin inserted—that is to say, for each coin the carrier makes one movement. The pointer also, under the influence of the ratchet-wheel and the pawl (which latter, as has just been shown, is indirectly connected with the carrier), will, on each movement of the carrier, register a degree on the dial; and thus a check is kept on the number of coins inserted. The pointer shown black may have a peculiar shape or colour, to distinguish it from the other pointer, which indicates the amount of gas consumed; and, as they both move in opposite directions round the dial, the divisions, in this case, may also be numbered in opposite directions, as shown on fig. 1.

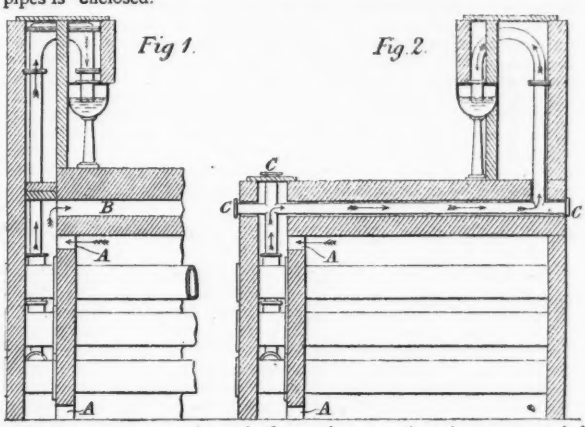
To prevent bent coins, or coins too large or thick, being inserted in the slot of the meter, a detector is placed over the entrance to the slot, and formed (as shown in fig. 1 and 4) with a vertical circular recess, just large enough to admit a coin of the proper diameter or contour. Leading down from this recess, is a slot of such width that a bent coin or anything thicker than a proper coin will not pass through.

Manufacture of Illuminating Gas.—Wilson, W. H., of Liverpool. No. 2073; Feb. 3, 1892.

This invention relates to the manufacture of illuminating gas from coal or analogous material; the object being to increase the illuminating power of gas made from a given kind of coal, and also to increase the volume from a given quantity or weight.

The proposal is to make gas from coal or analogous material in closed retorts or chambers, heated externally within a suitable bench or chamber; the mouthpieces, pipes, or other conduits by which the gas is conveyed away to the purifiers being "heated externally or maintained artificially at such a temperature above that at which they would normally be in ordinary practice, as to obtain the ends effected by this invention, or the gas coming from retorts, heated ducts, or other apparatus, is otherwise suitably or equivalently heated or maintained at the required temperature. This heating may be carried or maintained as far on towards the condensers or purifiers as may be deemed suitable or desirable, and the temperature may be graduated in some cases."

The illustrations of different modifications or arrangements are given in the specifications of these. In the arrangement shown in fig. 1, the waste hot products of combustion from within the bed are admitted therefrom into the space between the front wall of the bed and the outer wall; an arch or division being provided to convey such products to the main flue, after heating up the mouthpieces or ascension-pipes. The gases pass from the bed by apertures A in the front wall; and flow away from the space enclosed by the walls to the main flue by the passage B. Walls are provided for enclosing the upper part of the ascension-pipes, which part, however, would be heated by radiant heat; or, the gases, after heating the lower part of the pipes and mouthpieces, may pass into the space in which the upper part of the pipes is enclosed.



In the arrangement shown in fig. 2, the ascension-pipes are carried up to the upper portion of the bench, then along through a space in the roof of the bench towards the other end of the bed, and then up into the hydraulic main. The space, in this case, between the walls may be heated by radiation and conduction, or by the waste products of combustion, as above described. Such space, and the space within which the horizontal portion of the pipes lie, are in communication with each other. Suitable caps C are provided on these pipes, as shown in fig. 2, for the purpose of readily gaining access to them for cleaning or examination.

The effect of such apparatus is that the coal is distilled in the retorts in the ordinary way, and the gases produced are discharged into and carried by relatively hot pipes and conduits into the hydraulic main; the temperature being preferably graduated—falling as it travels farther from the mouthpieces. The temperature to which the mouthpieces and lower half of the ascension-pipes are heated may be in excess of the temperature of the gas as it comes away from the retorts and enters the mouthpieces; or it may be about the same temperature. When an excess of temperature is maintained in the mouthpieces and ascension-pipes, says the patentee, they may be raised to, and maintained at, about 400° to 600° Fahr.; and as the gas rises and passes through the ascension-pipes, it becomes gradually cooler towards the hydraulic main, where it may be diminished by (say) 200° to 400°. Of course, if a hydraulic main is employed, the temperature of the liquor therein should not be raised to its boiling point, but may be kept with advantage just under it. This is done by so graduating the reduction of the temperature of the gas from the retorts, that, by the time it reaches the hydraulic main, it is only sufficiently hot to keep the liquor at a high temperature, but under boiling point. Or, if the gas is discharged into the hydraulic main at a relatively high temperature, the main may be supplied with a large quantity of water, or so maintained in a cool condition as to prevent boiling. By thus increasing the temperature of the gas, and graduating it as it passes to the hydraulic or other outlet main, or by retaining its heat and graduating it, the illuminating power of the gas is increased; and stoppages of the ascension-pipes are "absolutely avoided."

If the main by which the gas is carried away from the ascension-pipes be a dry one, the particulars just specified with reference to the hydraulic main, as regards the maintenance of temperature therein, do not obtain; and this main may itself be graduated as regards temperature between the retort-beds and the condensers. Also in applying the invention to the method of making coal gas in which the coal gas is passed through a secondary heated retort, or what is called double distillation [the Dinsmore process], the pipe or pipes by which gas in such cases is led away from the second retort or heated conduit, is treated substantially in the same manner as the mouthpieces and ascension-pipes of the apparatus above described.

Mixing Inflammable Gas or Vapour with Air.—Smethurst, W., of Fulham Road, S.W., and Wade, J., of Cheapside, E.C. No. 2207; Feb. 4, 1892.

This invention relates to apparatus in which ordinary gas or hydrocarbon vapour is mixed with air; the objects being: "First, to effect by simple and inexpensive means, the perfect and permanent mixture of gas or vapour with air; second, to provide means for accurately regulating the relative proportions of gas or vapour and air in the

mixture; third, to make the mixture more intimate, perfect, and permanent, than has heretofore been the case; and, fourth, to enable the mixture to be burned under water."

Furnace Grates or Fire-Bars.—Meldrum, J. J. and T. F., of Manchester. No. 2353; Feb. 8, 1892.

This invention in reference to furnace grates, or fire-bars used in and constituting such grates, has for its object, chiefly, to provide means for preventing the bars from becoming misplaced accidentally or otherwise. The bars have cast upon them, or are provided with, projections, buttons, or their equivalent, at one side; and on the other side, they are formed with corresponding recesses or apertures, with which the projections engage or fit. Or, as a modification, the projections may be formed on alternate bars of the grate, and the recesses or apertures in the other half set of the bars. In some cases, in fitting the bars in the grate, the projections on the side of the bars on the outside of the grate are removed; and in some cases (such, for instance, as when the bars are to be fitted tightly sideways), the projections may be removed from the last two bars.

Gas-Engines.—Instone, A. J., of Aldershot. No. 3047; Feb. 16, 1892.

This invention relates to both gas and oil engines having an oscillating cylinder working on a trunnion joint, which acts as the valve governing the release to the exhaust, and having a mixing-chamber into which an explosive charge is pumped by each inward stroke of the piston, and wherein the charge is compressed, by the outward stroke of the piston, sufficiently to enable it to displace the residual gases of the previous explosion, and expel them from the cylinder to which the explosive charge is delivered, while the exhaust is open. The piston on its inward stroke also completes the expulsion of the residual gases from the cylinder, and then compresses the explosive charge, which is fired on the completion of the stroke; the cycle being such as to give an impulse at every revolution.

Gas Motor Engines.—Hamilton, J. H., of Sandiacre. No. 4189; March 3, 1892.

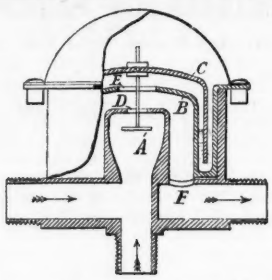
The first part of this invention relates to gas admission-valves in engines of the type described in patent No. 16,434 of 1889—an admission-valve with an annular gas-valve surrounding its stem. The gas-valve is a loose sliding fit on the admission-valve spindle; and a collar is fixed on the latter below the former, in such a position that the admission-valve has a certain amount of free lift before the gas-valve can be opened. Two notches or steps are formed in the end of the admission-valve spindle, so that when the push-piece enters the outermost, the admission-valve is lifted through a greater distance than the clearance between the collar and the gas-valve; and the latter is also lifted. But when the push-piece enters the other notch, the admission-valve is raised through a less distance, and the gas-valve will not be opened.

The second part of the invention relates to a governor. To a fixed part of the engine is pivoted a lever or bell-crank, and a weight is placed on one of its arms (such arm being preferably horizontal); and to the same lever or bell-crank is pivoted a tumbler piece with two slots or notches in it. One of these is adapted to engage with a pin fixed in the lever which operates the valves, and the other with a pin in the push-piece. The former pin rests in the bottom of its notch when the lever is full back, or farthest away from the admission-valve spindle, and the latter pin strikes the bottom of its notch when the lever and push-piece are advancing towards the valve-spindle; the tumbler being so arranged that, when the pin in the push-piece comes in contact with the bottom of its notch, the weight on the lever or bell-crank shall be descending. If the speed of the engine be too great, the violence of the impact will overcome the pull of the spring which keeps the push-piece against the stop, and it will be thrown to one side, so as to engage with the innermost notch; and thus the gas-valve will not be opened.

The third part of the invention relates to an igniting device, for facilitating the starting, and for timing the ignitions after the engine is started. For this purpose a separate block of metal is used, into which is screwed the ignition-tube, and to which is attached the chimney. In this block is drilled a hole, communicating with the interior of the combustion chamber; and the other end of this hole is closed by a timing-valve opening outwards. From the chamber containing this valve, two lateral passages are formed—one leading to the ignition-tube, and the other to a chamber which has an outlet to the atmosphere, closed by another valve opening inwardly. These valves may both be operated from one lever, and may be connected to it by screws geared together. The action is as follows: The Bunsen burner being lit, the tube is brought to a red heat, the engine is turned past the back centre on the explosion stroke, and the screws properly adjusted. The lever is then pressed in till the timing-valve nearly rests on its seat, and the other, or inwardly-opening valve is almost full open; the lever being held in this position by a catch, and a jet lit outside the external orifice of the ignition chamber. A charge of gas is then introduced, either by forcing it in by a pump or by letting the pressure of the gas force it into the combustion chamber, till it burns outside the external orifice of the igniting device. The catch may now be released, thus shutting in the flame in the igniting chamber, and fully opening the timing-valve leading to the combustion chamber, so as to ignite the charge therein. When the engine has been properly started by this ignition, the screws may be so adjusted that the inwardly-opening valve shall not be opened at all. The other valve will then act simply as a timing-valve, opening a connection between the combustion chamber and the ignition-tube at the right time.

Gas-Governors.—Martin, E. G., of Cheltenham. No. 8722; May 9, 1892.

This gas-governor consists of a regulating-valve A, carried upon a rod with nuts. B is a fixed dome or chamber; and C a loose dome or regulator, enclosing the dome B, and resting in a trough, which may contain mercury. The gas enters by one or both of the pipes shown at the left-hand side and bottom, and passes up the central enclosure



through the ports D, and thence to the outlet through the port F. The gas entering at a pressure will ascend through the port E, and fill the space formed between the two domes; and any variation in pressure will act upon the loose dome C, and either raise or lower it in obedience to the increased or diminished gas pressure, and in so doing act upon the valve A, and lessen or increase the flow of gas through the port D, which thus controls the supply of gas to the outlet.

APPLICATIONS FOR LETTERS PATENT.

1105.—Busse, J., jun., "Gas-pressure regulator for use in gas motors and gas lighting." Jan. 18.

1181.—Sewell, J. R., "Compressed air, gas, water, or other liquid motor." Jan. 19.

1246.—Edwards, W., "Gas-lighting appliances." Jan. 20.

1269.—Gibbons, W. P., and Masters, R., "Setting gas-retorts." Jan. 20.

1277.—Burt, P., and M'Ghee, G., "Gas or explosive vapour motor engines." Jan. 20.

1290.—Bemelmans, L., "Gas-generators." Jan. 20.

1356.—Sloss, A. M., "Electric gas-lighting appliances and devices." Jan. 21.

1411.—Sheard, J. T., "Automatically varying the pressure of gas in mains or pipes." Jan. 23.

1417.—Coulthurst, H., J., and A., "Manufacture of gas-retorts. Jan. 23.

1501.—Boult, A. J., "Water-meters, also applicable as circular pumps or motors." A communication from T. Derichs. Jan. 24.

1658.—Fletcher, T., and Clare, A., "Improvements in burners for gas-fires in ordinary coal-grates." Jan. 25.

1701.—Baldwin, J. E., "Plugs or valves for regulating and for shutting off water, gas, or other fluid in pipes, while effecting repairs and the like." Jan. 25.

1702.—Day, J., and Sterne, L., "Petroleum, gas, and other vapour engines." Jan. 25.

1718.—Bean, H. W., "Automatic extinguishing gas-bracket back." Jan. 26.

1726.—Turner, M. J.. "Turner's patent safety poker gas-fire lighter." Jan. 26.

1768.—Murray, K. S., and Brin's Oxygen Company, Ltd., "Keys, levers, or devices for opening and closing the valves of high-pressure gas cylinders, or for other similar purposes." Jan. 26.

1861.—Lake, H. H., "Self-closing gas-burners." A communication from E. F. Angell. Jan. 27.

1912.—Chesterton, W. J., "Glass globes for gas-lights." Jan. 28.

1918.—Gubbins, J. E., "Improving the light obtained from the burning of coal (or other similar) gas, by the use of oxygen gas." Jan. 28.

Gas-Engines for Pumping Purposes.—At the last meeting of the Works Committee of the Hull Corporation, the minutes presented by the East District Stoneferry Drainage Sub-Committee contained a report from the Borough Engineer (Mr. White), in which, adverting to the Committee's resolution of the 30th of September, he stated that, on considering the design of the East District Pumping-Station, the advantages of gas-engines worked by Dowson gas had presented themselves very strongly to him. He wished, however, to have the Committee's instructions before making any striking divergence from previous practice. He then submitted a comparison of gas plant with direct-acting steam plant, and said that, taking all the circumstances into consideration, he had no hesitation in recommending gas power.

The Liabilities of Contractors.—In the Court of Appeal, last Wednesday, the Master of the Rolls and Lords Justices Bowen and Smith heard the arguments in an appeal from a judgment of Mr. Baron Pollock and Mr. Justice Hawkins in an action brought by a Mr. M'Donald against the Corporation of Workington. The case was reported in the Journal for Nov. 15 last (p. 869); the facts being shortly these: The action was to recover £7000, the price of work done in making a sewer; the contract not having been completed under the following circumstances: Mr. M'Donald proceeded to execute the work, which consisted of laying a 2-feet pipe under the streets of Workington from a point high up in the town to the shore. At the shore there was a bank 50 or 60 feet high, which lay between the beach and the end of the pipe. This bank was to have been tunnelled; but it was found that it was not composed of clay, but was moist ground, in which it was impossible to carry out the work in the way mentioned in the specification. Thereupon the plaintiff asked the Corporation to give him an order to do it in a way not mentioned in the specification. Their Surveyor refused to give such an order; and the plaintiff thereupon threw up the contract. The matter came first before Mr. Hemming, Q.C., the Official Referee, who gave judgment for the Corporation. Against this the plaintiff appealed to the Divisional Court, where he was unsuccessful. In the Court of Appeal, it was contended that the appellant was entitled to payment for the work which had been done, as the Surveyor had been prevented by the defendants from giving a certificate which he ought to have given; and, further, that there had been no breach of contract on the part of the plaintiff. Their Lordships were of a different opinion; and they dismissed the appeal.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Experimenting with a View to the Development of Gasholder Construction.

SIR,—The material used in the sheeting of the large holder for the South Metropolitan Gas Company, referred to by Mr. Cripps in his third article on the above subject (see *ante*, p. 140), may be taken as approximately 300 times as strong as the brown paper used in the 5-feet model. The strain applied to the smaller holder was proportionate to a very heavy gale on the larger; and it withstood it, although showing a small amount of distortion.

Is there anything, theoretically speaking, to prevent holders as large as the larger one being built of brown paper, if provided with a lower set of sides giving a pressure of at least 3 inches? Is there any danger, in practice, in building such a holder of material 300 times as strong? Mr. Cripps holds the opinion that there is great danger. In venturing to differ from this view, I do so with all deference to Mr. Cripps's great authority, and with the possible refutation of the argument I have put forward well in view.

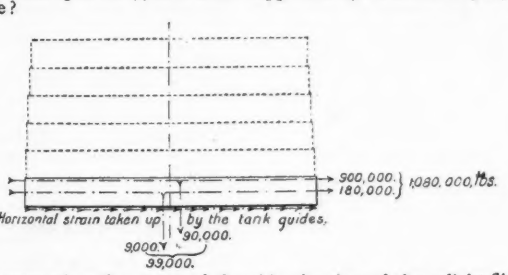
I should like, however, to say another word or two in support of my client, if I may so call the "light flimsy bell" of Mr. Cripps, with a view to putting it, if possible, into a better position to stand up by itself. My letter in your issue of the 27th inst. is somewhat involved, because it refers to the effects of pressure on the model, and also on an ordinary holder. Shortly, the difference I wish to draw between the two is that in the case of the former the sides have no power to resist compression, but are extremely light, whereas in the latter the sides have weight but a strength equal to it. The former were shown by the model to be able to resist compression when inflated, because the expansive power of the gas was much in excess of the weight of the holder above the water-line, so that the crown could not approach the water-line without meeting with opposition from the gas. In the latter case, when the holder is inflated, the gas and the holder are in equilibrium—the gas lifting the holder, and the holder hanging on the gas; but then the initial power of the sides to resist compression must not be forgotten. This is always available to meet outside influences. The former case (the model) may be neglected, as it is the latter only that is of practical interest.

It was seen that the paper model, built in the proportion of 5 to 3, and giving 3 inches pressure, could stand reasonably well. If my argument is correct, then any holder of this proportion, giving 3 inches pressure, and able to stand in an uninflated condition, will be abundantly strong when inflated; for, as remarked above, its own strength is equal to its weight—that is, 3 inches over the area—and this is in reserve. Without any doubt also, the strength of the side sheeting is very much greater under inflation; therefore, when in this condition, there is a surplus beyond the uninflated strength of the holder to meet the force of the wind.

It is often shown, while holders are being built, that the sheeted sides are well able to stand by themselves. If, then, it is taken that the sides of a holder can withstand only just their own weight, it becomes a question of whether or not the wind can exert a pressure greater than this. Unless it can, there is no chance of distortion; and this without reference to the great additional strength in the sides due to inflation—a quantity that increases in proportion to the height and weight of the holder.

If a 100 feet by 25 feet single-lift gasholder be taken as an example, it will be found that there is standing on the bottom curb, in the form of side sheets, a weight of 20 tons. The weight of wind to be supported by an upward resistance in the sides, when the holder is inflated, is about 2¾ tons—less than one-sixth of the compression on the sides while in course of building. The weight of the crown is left out of account on one side, as are the surplus of initial strength in the sides over and above that sufficient to support their own weight, and also the strength they gain by inflation on the other.

To take an instance of a holder on the very largest scale (the six-lift holder of the South Metropolitan Gas Company), the wind pressure on the top five lifts approximates to 900,000 lbs. This is resisted by the top of the sixth-lift, and sets up in that lift a compressive strain in the side sheeting—presuming always that the bottom curb is kept level. The wind pressure on the sixth lift does the same, to a certain extent. The two combined work out, if my figures are correct, to 44 tons. The weight of the side sheeting alone, with the dip standing on the curb, is about 136 tons. If the sheeting immediately above the curb can resist this compressive strain when not inflated, cannot it be relied upon for 44 tons when supported by 12 inches of pressure inside?



In supporting the cause of the side sheeting of the "light flimsy bell," the use of the ordinary vertical stays as a guiding agent does not come into question. But whether they add appreciably to the stiffness of the holder is, to my mind, pretty much on a par with an inquiry as to whether the rain-pipes of a house are to be relied upon for support.

E. LLOYD PEASE, Managing-Director,
Ashmore, Benson, Pease, and Co., Limited.

Stockton-on-Tees, Jan. 28, 1893.

As my letter of the 28th ult. was not in time for insertion in the last issue of the JOURNAL, perhaps I may be allowed to add one or two remarks bearing on Mr. Cripps's article in that number.

It has obviously not been my part, in these letters, to "back" a gasholder either with or without columns as the infinitely superior type. In the first place, it is for each engineer when purchasing a gasholder, to get what he is personally best pleased with; and, secondly, I am an interested party, and my views would be subjected to a heavy discount. As, however, Mr. Cripps assails the columnless holders with all manner of theories, perhaps I am justified in offering to match his extracts from an unpublished article, by one fact also unpublished up to now. On the continent of America, a two-lift 90-feet holder in an iron tank on the ground-level, when recently finished and fully inflated, chanced to stand in the direct path of a cyclone that left a distinct track behind it across the town. The holder suffered to the extent of one cracked carriage (probably through a faulty casting). The cyclone had no effect whatever on the gasholder itself; but the theories which are supposed to be inseparable from such holders, and which Mr. Cripps champions, were blown clean away from that locality, at any rate. The holder was supported by wire ropes only.

I see that there is to be a final article, in which the views of critics are to be dealt with; and that a place is already booked for me. As I do not wish to unduly monopolize valuable space, perhaps I might suggest that it would be well if the criticism, as far as I am concerned, were limited to the question as to whether the arguments I have brought forward have or have not supported the theory that there is "greater strength in the side sheeting of a gasholder than is generally credited."

As to the rough experiments I made, probably nothing more need be said, as I am afraid, in Mr. Cripps's mind, they fall within the category of experiments which, in his view, "only prove that there is something sadly wanting either in the experiment or in the experimenter—probably both." This is really very painful; and the subject had better drop.

Feb. 3, 1893. E. L. P.

Electric Lighting for Lancaster.—The Lancaster Town Council have lately resolved to apply to the Board of Trade for power to borrow £25,000 for the purpose of carrying out an electric lighting installation for the town.

Colne Valley Water Company.—In the report of the Directors of this Company for the half year ending Dec. 31 last, which will be presented to the proprietors at the ordinary general meeting on the 14th inst., the net profit is stated to have been £3821; making a total of £7576 for the year 1892, as compared with £7101 for the preceding twelve months—showing an increase of £475. The amount available for division is £2391, out of which a dividend for the half year at the rate of 3½ per cent. per annum will be recommended; leaving £162 to be carried forward.

Sales of Stock and Shares.—The Directors of *The Gaslight and Coke Company* are inviting tenders for £50,000 of new ordinary "A" consolidated stock, the minimum price of which has been fixed at £220 per cent. Any amount, being not less than £5 or a multiple thereof, may be tendered for; and full payment is to be made before the 27th inst.——At Hastings last Tuesday, Messrs. Bray disposed of 20 £10 shares in the *Hastings Electric Light Company* at a premium of 10s. each; and, on the same occasion, two £20 shares in the *Hastings Gas Company* realized £40 2s. 6d. apiece.——Ten £10 (7 per cent.) shares in the *Maidstone Water Company* have changed hands at £19 per share; and 19 lots of £50 consolidated stock in the *Maidstone Gas Company*, including the half-year's dividend due on Dec. 31, 1892, have been disposed of at the following prices: Two at £101 10s., nine at £101, and eight at £100 10s. each. £31 stock changed hands at £63; while nine lots of £25 stock realized £50 10s. each.——At Preston, last Thursday, £500 of "B" stock of the *Preston Gas Company* was offered for sale, and realized prices from £143 to £143 10s. per £100.

Electric Meters at Bath.—We take the following from the *Electrician* of the 28th ult.: "Some of the customers of the City of Bath Electric Lighting and Engineering Company are complaining of the action of the Directors in having departed from the contract system, and substituted meters. The receipt of the bills for the Christmas quarter, says the *Bath Argus*, greatly surprised several of the customers by reason of the unlooked-for excess of the charge by meter as compared with the sum hitherto paid under the contract system. One tradesman had contracted for a supply for £22 a year; and last quarter's bill, when the charges were made according to meter, amounted to only about £3 less than the sum for which a year's supply was originally contracted for. In the corresponding quarter of 1891, another firm was charged £5, and for the three months ending December, 1892, they had to pay £14. Another paid nearly £8, as against £2 10s. by the contract system. In the case of one establishment, the Christmas quarter account comes to £15 10s., whereas the contract price per quarter is only £11; and in another city business, where the contract is for 36s., the last demand amounted to considerably over £4 for the quarter. It is said that many will refuse to continue the light unless some reduction in the price takes place, although private consumers in Bath pay less per Board of Trade unit (6d.) than those in other towns. Some of the consumers say that they would never have entertained the idea of having the light laid on had the probability been held out of such a change taking place; it being represented at the time that the uniform charge of 6s. per annum for a 10-candle power lamp would be cheaper than the price of gas, and that the Company would be able to pay a substantial dividend at this charge for consumption. Some of those who entered into contracts with Mr. Massingham had a proviso added to the agreement to the effect that no increase should be made in the charge for the first seven years; and in these cases the consumers are exempt from the meter arrangement. A public meeting will probably be held." Commenting upon the foregoing, our contemporary said: "Had the City of Bath Electric Lighting and Engineering Company possessed a trained diplomat on its staff, the blunder of switching over from a contract to a meter supply just as the dark days were beginning would not have been committed. The change should have been made during the dog days, and the consumers should have been brought gradually up to the fence."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The second session of the 25th Parliament of the United Kingdom opened last Tuesday with the customary formalities; and the first day's proceedings included the usual batch of notices of motion for leave to introduce Bills. Prominent among them were those relating to labour questions. Mr. John Burns was to the front with a Bill "to regulate the hours of labour to eight per day, or 48 per week, in all trades and occupations; and to make provision enabling the organized members of any trade or occupation protesting by ballot against the same, to exempt such trade or occupation from its provisions, miners excepted." Mr. W. Mather, the Liberal member for Gorton, proposed to bring forward a less strictly-defined measure. It was a Bill simply "to authorize the regulation of the hours of labour of the working classes." Mr. Macdonald, who represents Bow and Bromley in the Liberal interest, gave notice of a Bill "to limit labour in the service of the Crown, of local authorities, and of railway companies to eight hours a day;" and Mr. J. Ernest Spencer, the Conservative member for West Bromwich, of one "to establish a Ministry of Labour, to be presided over by a Minister to be called the Labour Minister." Other notices of motion were for Bills to amend the Municipal Corporations Acts; the Railway Rates and Charges Order Confirmation Acts, 1891 and 1892: the Railway and Canal Traffic Act, 1888; the Companies' Act, 1862; the Public Health (Ireland) Act, 1878, for lighting purposes in the county of Dublin. Notices were also given of Bills "for better securing uniformity in the assessment of rateable property in the Administrative County of London, for establishing a tribunal to deal with assessment appeals, and for other purposes;" for the national registration of plumbers; and for amending the law relating to weights and measures. The foregoing measures were introduced during the week; and, as far as their provisions immediately concern our readers, notice will from time to time be taken of their progress.

BILLS TO ORIGINATE IN THE UPPER HOUSE.

Pursuant to an order of the House, Mr. J. Stansfeld conferred with the Chairman of Committees of the House of Lords (the Earl of Morley), for the purpose of determining in which House the respective Private Bills should be first considered; and they decided that the following, in which our readers are interested, should originate in the Upper House: Accrington Gas and Water Bill, Belfast Water Bill, Bilston Commissioners Water Bill, Chatham Corporation Water Bill, Crystal Palace District Gas Bill, Dublin Corporation Bill, Frimley and Farnborough District Water Bill, Imperial Continental Gas Association Bill, New Swindon Gas Bill, Pontypridd Local Board Gas Bill, Rathmines and Rathgar Water and Improvement Bill, Rochester Extension and Water Bill, Runcorn Water Bill, Sheffield Corporation Water Bill, Staines and Egham District Gas Bill, Stockton-on-Tees Corporation Gas Bill, Todmorden Local Board Gas Purchase Bill, Weaver Navigation Bill, and Wolverhampton Gas Bill.

Cheap Gas for Heating and Motive Power in West Kent.—With the view of increasing the sale of gas in their district, the West Kent Gas Company are repeating the offer they made a few years ago to supply gas used for heating and motive power at a reduction of 6d. per 1000 cubic feet.

The Electric Lighting Question at Brighton.—Mr. T. Codrington, one of the Inspectors of the Local Government Board, held an inquiry last Tuesday at Brighton, relative to the application of the Corporation for sanction to borrow £37,700 for purposes of electric lighting. A number of the customers of the Hammond Company were represented; and it was stated on their behalf that they feared they might be prejudiced if the Council entered upon a larger area of supply before the works in the original area had been consolidated.

A Novel Solution of the Unemployed Question.—"An original and somewhat ingenious solution of the question of the unemployed," writes a correspondent, "has been lighted upon by a labourer in the ancient kingdom of Kerry. An 'out-of-work,' in an out-of-the-way village called O'Dorney, conceived the idea of relieving his distress by a raffle. The tickets were 6d. each; and the winner was to have one week's work from this knight of the shovel without having to pay any wages. The investment appears to have been largely availed of; but the irony of fate would have it that the winner turned out to be a poor agricultural labourer, who, of course, had no work on which to employ his prize. The result was that the inventor of the system had his pocket of sixpences, and a week's leisure to boot, as reward for his ingenuity. This took place but a fortnight since; and it is to be found recorded in the *Cork Examiner*, apparently properly vouched for."

The Transfer of the Stourbridge Gas-Works to the Improvement Commissioners.—At the meeting of the Stourbridge Improvement Commissioners on the 30th ult., a discussion took place on a report from the Gas Committee, in which it was stated that an application had been made by the Clerk for an increase in his salary, on the grounds that the business connected with the purchase of the gas-works and negotiating the loan had enormously increased his personal work; that the cost he had been put to during 1892 in obtaining the necessary clerical assistance had exceeded his ordinary salary; and that the work connected with the purchase would be heavy, and his responsibilities greatly increased, up to the completion thereof in June next. The Committee had considered the matter, and had resolved to recommend the Board to make an increase to the extent of £500 for the period of the current half year up to June 30 next; this sum to be treated as an expense incidental to, and part of the purchase-money of, the gas undertaking. The recommendation gave rise to considerable adverse criticism; and a proposal was made to refer the matter back to the Committee. On being put to the vote, however, it was lost; and the increase was sanctioned.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Feb. 3.

(*Before Mr. Justice* CHITTY.)

Cox and Others v. Wenham Company, Limited.

This was a motion by the plaintiffs, as debenture-holders, seeking to restrain the Company from carrying on their business other than in the ordinary course, in accordance with the terms of the debentures, and also for the appointment of a receiver.

Mr. WHITEHORN, Q.C., and Mr. ASHTON CROSS appeared for the plaintiffs; Mr. BYRNE, Q.C., and Mr. RAWLINS represented the defendants.

The plaintiffs' case was that the Company were jeopardizing the security for the debentures; and they asked for the appointment of a receiver. A great deal of evidence was filed on either side; and the opening statement in support of the motion occupied a long time.

Mr. BYRNE, for the respondents, spoke for about five minutes only; and asked that the motion might be dismissed, with costs.

Justice CHITTY, in giving judgment, said the total amount of debentures was £17,500. The plaintiffs represented £1400 of it; and it appeared that debenture-holders to the amount of no less than £13,000, though they were not parties to the proceedings, opposed the motion altogether. There was no petition to wind up the Company, nor any evidence that any of its creditors were pressing. The Articles of Association gave the Directors full power to carry on the business in any way that seemed most beneficial. The security for the debentures was a floating one; and it was an essential feature of such securities that the Directors should be able to carry on business without interference by the debenture-holders. There was no ground for imputing any bad faith to the Company, or any intention to treat the debenture-holders unfairly; and therefore the motion must be dismissed, with costs.

LEWES (ADJOURNED) QUARTER SESSIONS—Thursday, Feb. 2.

(*Before the Earl of* CHICHESTER, *Chairman, and other Justices.*)

The Assessment of the Eastbourne Gas and Water Works.

Some important assessment appeals engaged the attention of the Court on the above-named and the previous day. It appears that the Assessment Committee of the Eastbourne Union have determined (using the words of their leading Counsel in one of the cases) "to bring the property in Eastbourne up to its true rateable value;" and they have accordingly commenced with the large properties—such as the gas and water works, and some of the principal hotels. Both the Gas and Water Companies appealed against the increased amount of the valuation of their undertakings; and their cases were down for hearing to-day. Among the professional gentlemen who who were in attendance as witnesses were Mr. Corbet Woodall, and Mr. W. A. Valon, and Mr. H. E. Jones.

Mr. BALFOUR BROWNE, Q.C., Mr. HORACE AVORY, and Mr. S. H. DAY appeared for the appellants; Mr. H. B. POLAND, Q.C., Mr. MARSHALL HALL, and Mr. R. E. MOORE for the respondents.

On the case for the Gas Company being called,

Mr. BALFOUR BROWNE said he was pleased to say they had been able to come to an agreement with the other side as to the rateable value of the gas-works. Originally, the matter stood in this way: The Company's undertaking ran into two parishes—Eastbourne and Willingdon. In Eastbourne, the gross value was £2625; and the rateable value, £1750. In Willingdon, the gross value was £2950; and the rateable value, £1982. The gross value of the two together came to £5575. There was no appeal in respect of Willingdon, because there the valuation was not increased; on the contrary, the amount was reduced by £32. The Assessment Committee, however, put up the gross value in Eastbourne to £7385; and the rateable value to £5092. Subsequently, Mr. Marshall, the valuer for the Gas Company, and Mr. Cooke, the valuer for the Committee, met and discussed the matter, with the result that they reduced these figures to £6600 gross and £4300 rateable. The matter went on, and the Company appealed to the Court; but he was now able to say it had been arranged that the gross value should be fixed at £5900, and the rateable value at £3600. With regard to costs, there would be no dispute; both parties would pay their own.

Mr. POLAND remarked that this result only showed how important it was that the parties in cases of this kind should meet each other, with a full knowledge of the facts. The arrangement which had been arrived at seemed to him to be a very reasonable one.

After a short interval, during which Counsel discussed the assessment of the Water Company's undertaking,

Mr. AVORY said he was able to announce that they had also agreed as to the figures relating to the water-works. The gross value placed upon the concern by the Assessment Committee was £8200, and this was to be reduced to £7000; while the rateable value, which had been put at £6084, was to be brought down to £5500—the parties to pay their own costs.

Mr. POLAND mentioned that the gross value of the water-works was originally £4580; and the rateable value, £3075. The increased figures that had been agreed to on behalf of the Company were evidence that the concern was progressing by leaps and bounds in prosperity.

The CHAIRMAN expressed the concurrence of the Court in the agreements.

Gas, Water, and General Investment Trust.—At a meeting of the Directors, held last Friday, it was resolved to recommend the payment of dividends at the rate of 4½ per cent. per annum on the preferred stock, and 7 per cent. per annum on the deferred stock, for the half year ended the 28th ult.; carrying forward £5933. The sum of £5708 has been added to the reserve fund, which now stands at £70,050.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Chief Office, Horseferry Road, Westminster—Colonel W. T. MAKINS in the chair.

The GOVERNOR, in opening the proceedings, said he regretted that he would have to ask the Assistant-Secretary to read the notice convening the meeting, in consequence of the absence of the Secretary and General Manager (Mr. J. Orwell Phillips). It was a subject of very great grief to him personally, and he was sure it was to all his colleagues, that, for the first time for 34 years, their Secretary was not able, through illness, to be present. He believed the deterioration in Mr. Phillips's health was largely owing to his intense devotion to his duties. He had postponed for too long taking a holiday; and a period of rest would be necessary for him to regain his usual health.

The ASSISTANT-SECRETARY then read the notice convening the meeting; and the report of the Directors and the accounts (which were given in the JOURNAL last week) were taken as read.

The GOVERNOR, in moving the adoption of the report and accounts, stated that the expenditure on capital in the past half year had been £136,000, of which £97,000 had been spent on machinery and buildings in extension of the works, to meet the requirements of their district. About £30,000 had also been expended on lands—principally land and small houses they had purchased at Nine Elms, the latter of which had cut into their station there. The outlay would become immediately productive, as they would use the land as storeage room for coal, which they had been very much in want of previously. As regarded the present year, he believed that about £75,000 more would have to be spent to finish the extensions they had in hand; and, when these were completed, they would be in the position—in fact, they were now practically in the position—of having a manufacturing plant capable of producing daily 120 million cubic feet of gas, and a storeage capacity of about 106 millions, or about 95 per cent. of an ordinary winter day's consumption. With reference to the revenue account, there was nothing calling for any particular comment, save the question of residuals. Although the cost of coal had been less, its net cost had been higher by reason of the smaller amount they had received during the six months for the residuals. Except for this feature, the half year had been of a humdrum character. Nothing of a peculiarly exciting nature had taken place—no strikes, no lock-out, and no coal famine; but the depression in the residuals markets had been very decided. The result was that, instead, as he had expected, of their being able to add some £30,000 or £40,000 to the reserve of undivided profits, they were only able to make both ends meet, and to carry forward £500. He was very happy to say there was a little daylight in regard to the question of residuals. They would remember that the late Lord Beaconsfield used always to look, when he wanted to find some indication of the probable course of trade, to the chemical market; and their experience had justified his practice in this respect. There had been a very serious depression in the chemical market for the past eighteen months. On the last occasion of a depression in this market, it continued for three years; but he was glad to report that there were now decided signs of improvement; and it looked as if the crisis was not to be so prolonged on the present, as it was on the former, occasion. If this were so, and they had (as they would in that case have) a better comparison to make this year in connection with the price of their coal, he thought they might look forward to a prosperous half year, and to receiving next August, if all were well, a better account than they now presented. There was, however, nothing to alarm them in the position of the Company. It was progressing; but not "by leaps and bounds." It was impossible that the rate of progress which prevailed some years ago could continue, now that their district was filling up so much, and now that they had the electric light to compete with, although this competition was of little importance to them, comparatively speaking. They must, however, in the future look for a more moderate increase in their progress. He was not sorry that this should be so. He would rather go on with a steady business, advancing at the rate of 2 or 3 per cent.—and the average for the past twelve years was a little more than 3 per cent.—than that they should have a business which augmented so rapidly that they had to incur large capital outlay to meet the requirements of their customers in full. He believed that they would not have to spend any more capital for some years to come. They were very well forward now in making provision for the supply of gas; and with a reasonable residuals market, they would have a very good year, if they could continue their economies. He was very loth to prophesy; but he thought it was only right to say this, in the face of the great depression from which they had been suffering lately. He might remark that the worst feature with respect to their residuals was the question of coke; and in regard to this matter, it was very difficult for them to institute comparisons, because there was no company or municipality that he knew of placed in the same position with respect to the disposal of their coke as this Company. The whole of their make at Beckton, and a very large proportion of their make at Bromley—in fact, 60 per cent. of their whole production—had to be disposed of wholesale. It was sold to the cement makers; and the cement trade had been, and still was, in a very depressed condition. He could only express a hope that, as trade revived, the price of coke would also improve, and that their foreign exports would help them to a certain extent. No other company was in this position. He did not, therefore, wish the shareholders to be misled, as they might be, by any comparison with what might be done with coke by their neighbours, the South Metropolitan Company, or the Commercial Company, or anyone else. It was of no use making comparisons where the condition of things was not the same; and with regard to coke—and there were many other conditions which he might name—their position was different altogether from that of other companies. Their wear and tear account was a little higher this half year, though not appreciably so. It was a fault on the right side; but still it was a fault, and it ought to be corrected. They had given instructions that the estimates for the present year for wear and tear should be more correct. It was bad economy to let their works go down; but there was just the point at which they ought to arrive to keep them in proper condition, and at the same time not indulge in anything very great in the way of unnecessary provision for wear and tear. Another unsatisfactory item in their position—and one over which they had no control—was the rates and taxes. They had had a great battle on this matter, and had won it; but the advantage was not retrospective. It did not affect the past assessment of the Company, but only prevented a large increase in the prospective assessments, and thereby kept the loss from being still greater than it had been. The assessment remaining at its present rate, the rates in the pound had gone up from 5s. 1¾d. to 5s. 7d. This was equal to £8000 for the half year, and was £3000 more than the whole increase. They had not been assessed more on their property, but the rates had increased on the assessment; and he understood that this had principally taken place at Barking, Canning Town, and some of the East-end parishes, where the education rate had very largely increased. The law charges were also considerably higher. Part of this was owing to the assessment fight, the cost of which was, with the consent of the Auditors, spread over a period of years; but it was more largely due to the fact that they had opposed the efforts of the canal companies to increase their rate. They had been successful in this matter also; and, at any rate as regarded the Grand Junction Company, the canal rate was lower now than it was before that Company tried to increase it. In regard to the question of distribution, the position was very satisfactory, he thought, for they had increased all along the line—in the lighting of small dwellings, gas consumption, and meters and lights; and there had also been a considerable increase in stoves, which was the most satisfactory feature of all. They had now out on hire, with the number they had sold to customers in their district, nearly 60,000 stoves, irrespective of those supplied by firms with which the Company had nothing to do. Whatever might be the effect of mild weather, or any temporary cause of depression or want of elasticity in the rental, as long as they had (as they had had for many half years past) a substantial increase in every way, with more consumers and more methods of consumption, he did not consider that they could regard the Company as in a bad way. They had made some very satisfactory savings in the past half year, by the use of machinery for handling the coal. He would not take them into details, although he would be very glad to answer any question if he did not make the point clear; but he might say, shortly, that the result of their introduction of coal-handling machinery had been a saving of something like £15,000 in the half year. This saving would only be diminished by what would turn out to be the cost of wear and tear of this machinery—a very satisfactory feature with respect to which was that it had not tried to join any Trade Union. He was sorry to say that they did not see their way at the present moment to reduce the price of gas. He had hoped that they might now or perhaps next July take off the increase they had made in the charge; but, in face of the existing depression in the residuals market, he did not think it would be safe to do so. The deficiency on their working, after paying the full statutory dividend in 1891, was £281,000; and in order to meet this, they raised their charge, which gave them £265,000 in 1892. There was consequently a small reduction in the rate of dividend, owing to the advance in price. All the savings made on the working in 1892—savings amounting to about £230,000—had been swallowed up by the lower prices obtained for residuals. With reference to the sale of these, and their method of dealing with them (which had been canvassed in one of the trade journals during the past half year), a good deal of pressure had been put upon the Company to act with other makers of tar products. The Directors had tried both ways, however. When they first began to deal with their residuals, they had an agent who was entirely in favour of combinations; but they came to utter grief, and had to get rid of him. Since the present system had been in vogue, they had done very well indeed; and he (Colonel Makins) did not think they had very much to be dissatisfied with. But he, for one, would rather give up the position he held as Governor of the Company—a position which it was the great pride of his life to hold—than enter into any combination, ring, pool, "knock-out," or any trade trick, for the purpose of creating an artificial scarcity of residuals, because this was what it came to—nothing more or less. If they were to tie their hands behind their backs by arranging with the tar producers to restrict the output or keep their stocks back, they would probably be injuring themselves very much; and they might or might not benefit others. But he maintained that it was not legal for them—he doubted if their Auditors and the Government Auditor would approve of it—to commence a fresh half year with a very heavy stock of unsold residuals, simply because they did not care to put them on the market while the price was so low. They were in a totally different position to tar distillers generally. If the latter did not like the price that was ruling, they need not make the stuff. But the Company had to make gas, and therefore they had to produce the residual; and, being in this position, they must treat the question in the way best suited for their interest. He did not think he had anything further to say, except to allude to some remarks, more or less affecting gas companies, which were made a few days ago by a very great man. Mr. Preece had been appointed President of the Institution of Electrical Engineers; and, in his Inaugural Address, that gentleman dealt with electric lighting as one branch of his subject. Mr. Preece began his remarks by using some strong language with respect to persons whom he charged as monsters worse than any burglars or highwaymen—promoters of public companies under the Limited Liability Acts. It should, however, be remembered that many scientific gentlemen—very often with lots of initials after their names, and sometimes with the *imprimatur* of Government employment—had figured on the prospectuses of electric lighting companies, and their "carefully framed estimates" (he believed that was the phrase) always turned out to be inaccurate. He thought that, although the "game was blown," some of these gentlemen should pause before "splitting upon their pals" and "rounding on them." They had themselves been "in the swim." It was their estimates which had helped the promoters to float these companies; and it was hardly fair to lay on the promoters all the blame of the consequences. Mr. Preece saw that the game was up; and the question was, What was to be done next? The British investor was not now prepared to go into electric lighting companies, and

new ground must therefore be found, where, of course, electrical engineers would be found also. Municipalities and vestries were now looked to to take up electric lighting. He (Colonel Makins) did not know if anyone present had read the account by Mr. Eccleston Gibb of the installation at St. Pancras. But he had read it very carefully; and the conclusion he had come to was that, although his rates were pretty stiff in Westminster, he was thankful that he was not a St. Pancras parishioner, because he was convinced that, before very long, an account would be presented which would make some of the ratepayers open their eyes very widely. Mr. Preece made one remark which he thought was very peculiar—namely, that the glow lamp was, and would be in the future, "the poor man's friend." He (Colonel Makins) thought that the gas-light was the poor man's friend, for he could do many things with it which he could not do with a glow lamp. He did not know that the glow lamp was even the rich man's friend; for he heard recently of a very important Pall Mall club, the members of which, during the recent cold weather, were huddled together in the smoking-room cursing the electric light for its want of warmth, and bemoaning the departure of gas. The fact was, there were two sides to every question. The ordinary consumer of gas did not object to it on account of its heat, as Mr. Preece would lead one to suppose. This gentleman finished with a prophecy; and he had always noticed that scientific men were best when prophesying. His prophecy was that in the future, if they could get a twenty-four hours' load and the aid of a friendly waterfall, they would be able to supply current at a price something equal to gas at 2d. per 1000 cubic feet. He hardly thought that a gentleman occupying a position so great as that of President of a scientific society should give utterance to prophecies and language of this kind, which appeared to him (Colonel Makins) to be most fitly characterized as "sublimated drivel." He did not know that he ought to have taken up their time in dealing with Mr. Preece; but "the worm will turn," and gas companies were continually being attacked. Mr. Preece said that they ought themselves to have taken up the electric light, which was "strangling" them. If this strangling consisted of the purchase of many million cubic feet of gas from them, in order to feed the engines to drive their dynamos, the more they were strangled the better. The companies would not have been averse, had their consumers requested them to do so, to supply them with electric light as well as with gas, if Parliament would have granted them the powers and the capital for the purpose; but when the Board of Trade was approached on the question, that body distinctly declined to allow gas companies to take up the electric light.

The Deputy-Governor (Mr. H. C. Ward) seconded the motion.

Mr. Gaussen inquired how the increase of consumption corresponded with the increase in the capital account.

The Governor replied that the rate of increase of capital upon pre-existing capital was necessarily very much greater than a half-year's increase in rental. They had, for instance, to put up a large gas-holder, which would do for a very long time. The increase was 1 per cent. for the half year in the capital, and 2 per cent. in the rental; but, roughly speaking, they looked to expend on an average of years something like £200,000 a year, if their business went on increasing at the rate at which it had progressed for the last ten or twelve years.

A Shareholder asked the amount of capital which had been applied for recently, and the rate at which it was allotted.

Mr. G. Livesey expressed great regret at the remark of the Governor that there was no prospect of any immediate reduction of price. The remark was assented to by a cheer; but this cheer showed a total ignorance of the position in which they stood, and a total want of appreciation of the necessity for reducing the price. Shareholders were often very stupid; and Directors were frequently blamed for not raising their price. The Commercial Gas Company some time back had to increase their charge by 3d.; and a shareholder who was present at the meeting when this announcement was made said he was sorry that the Directors had not followed the example of The Gaslight and Coke Company, and raised their price to 3s. 1d. He thought this was a very suicidal policy. However, the suggestion he wanted to make was that their very able Accountant (Mr. Field) should improve the accounts—for he (the speaker) thought they would be an improvement—by stating the quantity of water and oil gas made. According to the figures, it seemed that 922,000 tons of coal had been used by the Company in the half year; and the gas made per ton appeared to be 10,900 cubic feet. A very large quantity of gas was made from oil; and he thought it would make the accounts more accurate if the quantity of oil gas made were mentioned. While on this matter, he might refer to the question of coal. He knew that the Company bought their coals from the North; and fortunately, or unfortunately, the coal contractors or owners in the North sold the Company coal at the same price as they charged to others. But by the time the coal reached the Company's works, the cost was 2s. a ton more than in the case of other buyers. He thought there was room on this point for economy and better management. With respect to ammonia, he saw by Mr. Field's tables of last year that the Company received for this product a rate of 1s. 4·8d. per ton of coal carbonized; whereas in the past half year—he took the quantity of coal actually used for this purpose—they received only 1s. 1⅜d., or a loss of 3d. per ton of coal. He did not think the other Companies had lost anything like the same amount; and he considered that this was a matter which required explanation. While on the subject of residual products, he might say that he had noticed with satisfaction, excepting on one point, the Governor's denunciation of trusts. The Governor had said that the Company were in a far different position from ordinary tar distillers; and so they were. Fortunately, or unfortunately, as the case might be, gas companies were in a protected position. If, by the sale of their products, they lost a considerable amount every year, they had only to clap on a few pence to the price charged to the gas consumer. In this way they were in a very different position to the ordinary tar distiller. If they were in the position of the latter, the Directors would use ordinary prudence in the disposal of their products. One of the principal products from tar was anthracene, which was a perfectly unique product. There was a demand for all that was made; and there was no substitute for it. Anthracene, however, had been tumbling in price lower and lower, until, from 4s. 6d. a unit, it dropped last autumn to 9d., and great fear was entertained that the price would go lower. He had been in communication with a number of the leading tar distillers; and they all told him that it was the fatal policy of The Gaslight and Coke Company that had driven down the price of anthracene to 9d. a unit, and that it might just as well have been 1s. 6d. or 2s. 6d. However, the price had gone up from 9d. to 1s. 2d., owing to the action of the tar distillers. Combined they were larger than the Chartered Company; and they said: "We will not sell anthracene at this ruinous price." The result had been that the Company a week or two ago sold some 500 tons of anthracene at a price showing an improvement of £7000. Whether they took part in these arrangements or not, they benefited by them; and he was glad that they should do so. There was another point he wished to refer to in regard to the sale of ammonia. He was informed—though he might be wrong—that the practice of the Company was to sell to dealers. Those who purchased the ammonia were not brokers, but dealers; and the Companies sold them the stuff, which was left on the premises of the Company at a rent. The dealers bought the stuff in the hope that the price might go up, and that they might thus sell it again at a profit. The price, however, sometimes went down, and then the Directors were forced to sell the stuff. In December, 1891, a sale of 600 tons was forced, because the dealers did not remove what they had agreed to buy; and the sale caused a considerable drop in the price of sulphate. The same system was now going on; and it was not good management. He had nothing whatever to say against the Company's agent, who, he believed, was a thoroughly honourable man; but he must say, with Sir Frederick Mappin, that the system was not right. At present their agent sold their products to-day, and bought someone else's to-morrow. He thought the Company should sell their products to a genuine broker, who was not in the position of a dealer. He was very sorry to see that Mr. Phillips was absent; but he heard on the previous day that, if it should unfortunately become necessary to find a successor to Mr. Phillips, Mr. Field, their Accountant, would be appointed General Manager. Mr. Field was one of the ablest Accountants he knew; but as that gentleman had taken a very great part in the general management of the Company in the past few years, he (Mr. Livesey) did not think the results were such as to warrant them in making Mr. Field General Manager, though he gave him every credit for being a first-rate accountant. With regard to the Directors, he wished also to say that he did not think that the business of this great Company could be managed by a meeting of the Board once a fortnight. They were paid about £800 a year each, or, allowing something extra to the Governor, about £700 each for the rank and file on the Board. He did not think that, by meeting once a fortnight, the business of such a great concern could be efficiently conducted.

A Shareholder said he noticed an almost similar amount charged half year by half year for bad debts. Between £15,000 and £16,000 a year seemed a very large sum to an outsider.

The Governor replied that it was only ¼ per cent. compared with the whole rental. Every effort was made to keep the bad debts as small as possible; but they had 200,000 consumers. The amount of their bad debts was shown not to be excessive, for it was less than some of the other gas companies.

Mr. W. Foster said he wished to ask whether the Board approved of the paid officials of the Company being engaged in private practice and in the conduct of joint-stock companies. He would move a resolution on this subject; but he supposed he had better do so when the motion was brought forward for the election of the retiring Directors, as that would give those gentlemen an opportunity of answering the question.

A Shareholder remarked that he was not able to deal with such questions as Mr. Livesey was; but there did appear to be some mismanagement in the Company during the last half year. They had been charging 3s. 1d. per 1000 cubic feet; while the South Metropolitan Company had charged only 2s. 6d. This meant that they had been receiving 23 per cent. more than the South Metropolitan Company. On the other hand, they had paid only 12 per cent. dividend; whereas the dividend of the other Company was 13 per cent. In other words, The Gaslight and Coke Company had received 23 per cent. more per 1000 cubic feet of gas, and yet had paid about 7 per cent. less dividend, taking the percentage of the distribution.

The Governor said he would answer the last speaker first. He had raised a very old question; and it was a case of a comparison of things which could not be compared. The South Metropolitan Company was a much newer concern, and worked under different legislation, with a different standard of price. It had newer works, and greater advantages, They therefore could not compare with the South Metropolitan Company as regarded the cheap production of gas. They had never been able to do so; and the Legislature recognized this fact when it gave this Company a difference of 3d. in the standard price. He would be the last man to attempt to detract from the very great ability shown in the management of the South Metropolitan Company; but to argue that because that Company was well managed The Gaslight and Coke Company was badly managed, was a *non sequitur*, and would require more proof than anyone could produce. The whole of their capital was applied for, and taken at an average price of £210 17s. 9d. That was for the last isssue. The tenders for the present issue would come in during the present month. The reason their coal cost more to place on their works was probably because it had to come farther, and to be carried by barges up canals. At Beckton, he expected their price was the same as at Greenwich and other places down the river. With regard to anthracene, he was quite sure that everything Mr. Livesey had done and written in the papers had been entirely with a benevolent intention towards this Company. As he had already said, they were always glad to receive assistance from those who knew better than they did; but, as he had said in his opening remarks, they had tried both plans, and had found the system now in force for dealing with all their residuals was the better one. As to their having been benefited by the rise in the price of anthracene by reason of the action of the tar distillers, he could not understand Mr. Livesey, because what they had done—following out Mr. Livesey's advice—had been to offer it to tender. They obtained three tenders for the anthracene—two from English buyers for 280 tons at 8¾d. and 7d. per unit; while two German firms tendered for the whole quantity they had to dispose of at 10 7/16d., and the latter, of course, obtained the stuff.

Mr. LIVESEY said he referred to the 500 tons lately disposed of.

The GOVERNOR said this was another transaction.

Mr. LIVESEY said that the tar distillers by their action had raised the price from 9d. to 1s. 2d.

The GOVERNOR: We got the price up to 10 1/16d.

Mr. LIVESEY: That was after we began.

The GOVERNOR: Well, *post hoc, propter hoc.* There had been a distinct improvement in the price of anthracene. They were on very friendly terms with the tar distillers. All they objected to was to tie their hands, and be bound to keep a stock until the tar distillers told them that they might let it go—the Company's stock being enormous. In further reply to a former speaker, the Governor added that there were two operations in connection with the last issue of stock. The whole amount asked for was £125,000. At the first tender, £101,095 was allotted at a price above the minimum, or £210 17s. 9d. Then, under the Act of Parliament, the balance not taken up was offered to the shareholders rateably. The amount so offered was £23,905, for which applications were received to the extent of £250,000. Each applicant therefore received about 5 or 6 per cent. on his holding. Mr. Livesey was mistaken in supposing that the Company made arrangements for storing ammonia for their customers. When a purchaser did not take delivery, and they wanted to clear off the stuff, they sold against him, as was done in every similar case. They made no arrangement for storing sulphate of ammonia which they had sold, so as to enable the buyer to take advantage of any alteration in the market. There was one remark which he wished Mr. Livesey had not made, as it came with painful suggestiveness to him that, having announced that Mr. Phillips was ill, and absent for the first time in more than 30 years, Mr. Livesey should have jumped to the conclusion that they were going to get rid of him.

Mr. LIVESEY said he had not meant anything of the sort. He had expressed his regret at the absence of Mr. Phillips. The fact was that a remark was made to him on the previous day, by a gentleman who was to some extent "in the know," and this had led him to say what he had said. If such an unfortunate event should be necessary as to find a successor to Mr. Phillips, he thought it best to say what he had said before it was too late.

The GOVERNOR said he declined to discuss such a hypothetical case. Should such an unfortunate case arise, he reserved to himself and his colleagues the right to do what they thought best for the interests of the Company.

Sir R. WYATT said he had no idea of speaking until he heard a remark from Mr. Livesey, which he regarded as the very essence of bad taste—that was, to raise the point of the possibility of Mr. Phillips not being able to return because he was absent from among them for the first time for 34 years. The time of all present was exceedingly valuable; and he thought these periodical attacks on the management were uncalled for.

The GOVERNOR said every shareholder was perfectly justified in saying whatever he thought right. All he himself said was that the point referred to had not arisen; and it was not in order to discuss it.

The motion was then carried unanimously, and the dividends were afterwards declared.

The re-election of the retiring Directors having been submitted,

Mr. W. FOSTER moved a resolution to the effect that the salaried officials of the Company should devote their whole time to the duties of their respective offices, and not engage in private practice, or in the conduct of joint-stock companies.

The GOVERNOR pointed out that this was not an amendment to the resolution.

Mr. FOSTER said his desire was to ask the retiring Directors whether they sanctioned the policy of the Directors in the past in allowing their officials to undertake the conduct of joint-stock companies. The former Engineer at the Pimlico station was permitted to engage in the management of a certain other company, one of his duties in connection with which consisted in going to the Medway once a fortnight. The gentleman in question was also at the same time a Director of three or four other companies. Six months afterwards this gentleman, at 50 years of age, retired on a pension from the Company. He considered the system complained of was a very bad one. The other point he wished to raise was that the Secretary was at the present moment on the Board of several other gas companies—the Brentford, Cagliari, Danish, Lea Bridge, Malta and Mediterranean, and Ottoman. He maintained that this Company, considering the magnitude of its operations, should have the whole of the services of its paid officials.

The GOVERNOR said he had not been aware that the former Engineer of the Pimlico station was a Director of the Medway Company.

Mr. FOSTER: And of four other companies.

The GOVERNOR, continuing, stated that he had not been aware of the fact until that moment. It had, however, nothing whatever to do with the retirement of Mr. Kitt from their service. It was found necessary to re-arrange the offices; and the gentleman in question was called upon to resign. As to Mr. Phillips being on the Boards of the Gas Companies mentioned, he knew that that gentleman was a Director of the Brentford, the Cagliari, and the Ottoman Companies, but he had not been aware of the others. They were, however, all kindred undertakings; and he believed that Mr. Phillips was on these Boards more to enable their Directors to consult him, and avail themselves of his great experience, and that he was not required to attend their Board meetings regularly. He could say most certainly that their Company had not suffered one iota from the fact of Mr. Phillips being a Director of the other Companies mentioned. He (the Governor) came to the office on most days of the week, and he always found Mr. Phillips present; and he knew that that gentleman was at the office from nine in the morning until it closed. He quite admitted that, in principle, the state of things referred to was not justifiable; and he certainly would not make it a practice to sanction the taking up of outside work by their Engineers, or by any officers of the Company.

The Hon. H. NOEL said the question which had been raised was rather an abstract one. He thought that, if it was stipulated, before any gentleman was appointed to an office in the Company, that he should not undertake any outside work, he was not entitled to do so. As to Mr. Phillips, he endorsed everything the Governor had said.

Mr. FOSTER remarked that Mr. Noel himself was at the present time a Director of eight Companies. He would like to hear what Mr. Aird had to say. He did not think that the position of that gentleman's firm had been attained by allowing his officials to serve other firms.

Mr. AIRD regretted that the question had been raised on that occasion owing to Mr. Phillips's absence. He thought it could have been much better discussed in his presence. He had no hesitation whatever in saying that, upon broad grounds, it was most undesirable for any officer connected with any company to hold an outside position. There were, however, special circumstances connected with Mr. Phillips's case. He was absolutely convinced, having known Mr. Phillips all his life, that nothing would induce him to do anything to interfere with the interests of The Gaslight and Coke Company.

Mr. FOSTER said he had not questioned anyone's individual character in the matter; but he claimed for every servant the privilege that was accorded to any of the officials.

The GOVERNOR said that the former Engineer of the Pimlico station applied to the Directors in July, 1881, for permission to serve as a Director of the General Gas Heating and Apparatus Company; and the Directors passed a resolution, which was on the minutes, to the effect that, deeming the exclusive attention of the Engineers at their respective stations to be necessary, they could not accede to Mr. Kitt's request.

After some very appreciatory remarks of Mr. Phillips and his services to the Company from Sir R. WYATT, the retiring Directors were re-elected, as were also the retiring Auditors.

Sir R. WYATT then proposed a vote of condolence with Mr. Phillips at the cause which had kept him away from the meeting.

Mr. LIVESEY seconded the motion. There had, he said, been differences between Mr. Phillips and himself. In business matters they had not agreed. At the time of the strike at the South Metropolitan Company's works, someone in Hyde Park said that the man who killed him (the speaker) would be a hero; and he should never forget receiving the next morning a letter from Mr. Phillips, saying that he would fight him in Court, or anything like that, but that he would stand by his side when such remarks as this were made. He very sincerely regretted the absence of Mr. Phillips, and hoped that it would be many years before they would lose sight of his genial face at their meetings. He had, perhaps, put his remarks rather badly, or they would not have conveyed the impression they had to the Governor or to Sir Richard Wyatt.

The motion having been carried, a vote of thanks was accorded to the Chairman and Directors; and this brought the meeting to a close.

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Accounts.

In the JOURNAL last week (p. 191), we published the report of the Directors of the above Company for the half year ending Dec. 31 last. We now give the accounts for this period; summarizing, as usual, those portions in which there is little change, and reproducing the remainder in full.

Statements Nos. 1 and 2 show the amount of share and loan capital raised at the end of the past year. The former was £2,080,000; the latter, £750,000—increases of £30,000 and £25,000 respectively as compared with Dec. 31, 1891.

Statements Nos. 3, 4, and 5—the capital, revenue, and profit and loss accounts—are given in full on the next page.

Statements Nos. 6, 7, and 8 show the positions of the reserve, renewal, and insurance funds. The balances at the close of 1892 were £45,352 12s. 3d., £10,704 2s. 5d., and £13,207.

Statements Nos. 9 and 10—furnishing particulars as to the manufacturing operations of the Company—are given in full; as is also No. 12, the general balance-sheet.

Proposed Transfer of the Mexbro' Water-Works to the Local Board.—The Mexbro' Local Board have (after several protracted discussions) decided to offer £10,000 to the Water Company for the property; and the Directors have accepted this figure. Before a final settlement is arrived at, however, an expert is to be engaged by the Local Board to thoroughly inspect the works.

Gas Exhibition and Cookery Lectures at Birstall.—On Monday last week, an exhibition of gas cooking and heating stoves was opened in the Temperance Hall, Birstall, by Mr. J. Mann, Chairman of the Local Board. The stoves were those of Messrs. C. Wilson and Sons, Leeds, and a variety of chandeliers, brackets, and patent lights were shown by Messrs. S. Dixon and Son, of Leeds. In connection with the exhibition, cookery lessons were given by Miss Smith, of the Yorkshire College. In opening the exhibition, Mr. Mann stated that the Gas Committee had determined to supply gas for cooking and heating purposes at 2s. 6d. per 1000 cubic feet—a reduction of 9d. on the ordinary price.

The Electric Lighting Scheme for Maidstone.—In the JOURNAL last week, we gave some figures from a report presented to a Committee of the Maidstone Local Board by Mr. W. C. C. Hawtayne, on a scheme for the establishment of an electricity supply station for the borough. The report has since been published *in extenso* in a local paper; and it differs in certain respects from the draft from which our figures were obtained. In the first report, 1d. per unit was stated to produce £437 10s.; in the second, it is put at £491. Again the working expenses were put at £2114; now they appear as £2292. The income from current was £2843; now on the basis of a larger sale and lower price, it is put at £2950. The interest on money to be borrowed was £640; now it stands at £446. In the first case, the interest is calculated at 4 per cent. on £16,000, the sum proposed to be borrowed; in the second, it is calculated at 4¼ per cent. on £10,500, the sum proposed to be at once called up and actually spent. The probable sale of electric current was originally reckoned at 105,000 Board of Trade units; in the later report it is put at 118,000 units. The net result of these variations appears to be to raise the estimated profit on the undertaking from £89 to £211 15s. a year.

ACCOUNTS OF THE SOUTH METROPOLITAN GAS COMPANY FOR THE HALF YEAR ENDED DEC. 31, 1892.

No. 3.—CAPITAL ACCOUNT.

Dr.

	£ s. d.	£ s. d.
To Expenditure to June 30, 1892	..	3,014,222 17 4
Expenditure during half year to Dec. 31, 1892, viz.—		
New buildings and machinery in extension of works	48,170 0 9	
New and additional mains and services	3,941 14 1	
Do. meters	6,484 8 5	
Do. stoves	6,469 13 10	
	65,065 17 1	
Cr.—By sale of land, &c.	7,700 0 0	
Total expenditure	..	57,365 17 1
Balance	..	3,071,588 14 5
		131,628 5 7
		3,203,217 0 0

Cr.

Description of Capital.	Certified to June 30, 1892.	Received since that Date.	Total to Dec. 31, 1892.
	£ s. d.	£	£ s. d.
By A stock	500,000 0 0	..	500,000 0 0
B stock	1,350,000 0 0	..	1,350,000 0 0
C stock	230,000 0 0	..	230,000 0 0
Debenture stock, 5 per cent.	725,000 0 0	25,000	750,000 0 0
	2,805,000 0 0	25,000	2,830,000 0 0
Premium capital	362,854 0 0	10,363	373,217 0 0
	3,167,854 0 0	35,363	
			3,203,217 0 0

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—		
Coals into store, including cost of petroleum spirit for enriching. (See Account No. 9)	£212,276 13 1	
Purification, including £5858 2s. 8d. for labour.	13,007 10 1	
Salaries of Engineer, Superintendent, and Officers at works	5,208 9 1	
Wages (carbonizing)	53,528 8 4	
Repairs and maintenance of works and plant, including £38,060 4s. 10d. for labour, less £849 7s. 11d. received for old materials	48,695 2 5	
		£332,716 3 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service pipes, including £7276 5s. 7d. for labour	£10,182 12 1	
Salaries and wages of Officers (including Rental Clerks)	9,024 6 2	
Repair and renewal of meters	3,883 17 11	
Do. stoves	3,790 15 2	
		26 881 11 4
Public lamps—lighting and repairing		6,318 15 6
Rents, rates, and taxes		19,298 0 9
Management—		
Directors' allowance	£1,750 0 0	
Salaries of Secretary, Accountant, and Clerks	1,769 15 8	
Collectors	4,658 6 4	
Stationery and printing	910 2 3	
General charges	3,770 11 0	
Company's Auditors	112 10 0	
		12,971 5 3
Law charges		222 4 11
Bad debts		1,634 2 9
Pensions and officers and men's superannuation and sick funds		3,801 2 3
Gas Referees and Official Auditor		212 15 6
Leasehold renewal fund		500 0 0
Total expenditure		£404,056 1 3
Balance carried to net revenue account (No. 5)		168,524 8 9
		£572,580 10 0

By Sale of gas—		
Michaelmas, at 2s. 6d. per 1000 feet	£120,400 14 9	
Christmas, at 2s. 6d. per 1000 feet	259,393 14 11	
	£380,794 9 8	
Public lighting and under contracts (see Statement No. 11)	23,828 7 8	
		£419,622 17 4
Meters in use, 83,292—		
Company's meters at rent (68,638)	£7,935 5 3	
Stoves at rent (19,569)	4,616 11 6	
		12,551 16 9
Residual products—		
Coke, less £11,891 1s. 9d. for labour, &c.	£96,524 2 10	
Breeze, less £1858 1s. 2d. for labour, &c.	1,437 4 6	
Tar, less £323 13s. 4d. for labour, &c.	16,964 7 4	
Ammoniacal liquor, less £225 3s. 7d. for labour, &c.	15,922 11 6	
Sulphate, less £2472 2s. 5d. acid, labour, &c.	7,530 19 10	
		138,389 6 0
Rents receivable		1,967 12 5
Transfer fees		48 17 6
Total receipts		£572,580 10 0

No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Dividend for half year ended June 30, 1892	£134,700 0 0	Balance from last account	£126,362 6 10
Fraction of dividend on A stock to reserve fund	500 0 0	Amount from revenue account (No. 4)	168,524 8 9
Interest on temporary loan and deposits	1,332 2 6	Interest on Bankers' balances	193 14 8
,, debenture stock	18,125 0 0		
Balance applicable to dividend on the ordinary stock	140,423 7 9		
	£295,080 10 8		£295,080 10 8

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1892.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, Dec. 31, 1892.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	26,594	393,394	355,727	255	64,006
Cannel coal	1,812	1,785	1,662*	—	1,935
	28,406	395,179	357,389	255	65,941

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

—	In Store, June 30, 1892.	Made during Half Year.	Used in the Half Year.	Sold in the Half Year.	In Store, Dec. 31, 1892.
Coke—cwt.†	91,454	4,429,387	1,060,057	3,262,046	198,738
Breeze—yards	4,970	63,311	15,282	47,393	5,606
Tar—gallons	724,120	3,472,440	34,851	3,783,984	377,725
Ammoniacal liquor—butts	12,112	117,481	31,911	84,278	13,407

* 105,847 gallons of petroleum spirit used as a substitute for cannel. † 1 cwt. of coke about equals 1 sack of 4 bushels, under Weights and Measures Act, 1878.

No. 11.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity made.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	3,632,922	211,336	3,142,640	3,353,976	49,757	3,403,733	229,189	18,868

No. 12.—BALANCE-SHEET.

To Capital—		By Cash at Bankers	£26,014 7 4
Balance—per account No. 3	£131,628 5 7	Amount invested—	
Reserve fund—per account No. 6	45,352 12 3	Reserve fund	£43,367 15 8
Renewal fund—per account No. 7	10,704 2 5	Renewal fund	9,601 7 3
Insurance fund—per account No. 8	13,207 0 9	Insurance fund	12,715 6 3
Net revenue account—for balance, per account No. 5	140,423 7 9		65,684 9 2
Debenture interest for amount due to Dec. 31, 1892	17,671 17 6	Cash in hand for sundry payments	500 0 0
Sundry tradesmen, for amount due for coals, stores, and sundries	54,216 14 6	Stores in hand—	
Deposits by consumers	27,810 9 6	Coals and enriching materials	£40,947 18 1
Dividend account (outstanding)	623 11 9	Coke and breeze	6,271 9 1
Debenture account ,,	10 11 11	Tar, sulphate, and ammoniacal liquor	5,491 4 9
Temporary loan	85,000 0 0	Sundry stores	81,418 6 8
C stock subscriptions	1,235 6 0		134,128 18 2
Workmen's bonus and savings deposited with the Company	23,717 17 11	Investment of workmen's bonus, &c.	4,955 19 6
		Accounts due to the Company—	
		Gas meter and stove rental, quarter ending Dec. 31, 1892	£281,442 14 6
		Arrears outstanding	1,336 0 8
			282,778 15 2
		Coke and other residual products	33,608 16 7
		Sundries	3,960 11 11
	£551,631 17 10		£551,631 17 10

PARA GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held on Monday last week, at the London Offices, 16, St. Helen's Place, E.C.—Mr. A. H. HENRY in the chair.

The SECRETARY (Mr. T. S. Borradaile) read the notice calling the meeting; and the report and accounts for the half year ending Sept. 30 last (which were referred to in the JOURNAL for the 24th ult.) were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, first expressed his regret that Mr. Ulick J. Burke was unable to be present to preside over their proceedings that day, owing to an unfortunate accident. He was pleased, however, to say that he was getting better; and they believed he would soon be with them again. Referring next to the subject of the contract for lighting Pará, he said that an advertisement was published on Jan. 19, 1891, inviting tenders for lighting the city; and, after due consideration by the Board, and at the wish of the shareholders, one of the Directors (Mr. T. Rumball) visited Pará, and did what he could in the matter. After he left, the negotiations which had been started by him were continued until June, 1892, when they fell through—the reason being that Pará was asking too much, and giving too little. He would give the shareholders a convincing proof that this was absolutely the fact. It had been practically agreed that the town should be supplied with 16-candle gas; but, at the last moment, a clause was inserted in the contract by the other side (and the Directors were led to understand that a contract would not be granted without this clause), limiting the supply of gas at each burner to 3½ cubic feet per hour; while, in order to give a light approaching 16 candles at each burner, the Company had offered to supply 5 cubic feet. The Municipal Authority wanted to test the illuminating power of the gas at the burner, and insisted that each lamp should afford a light of 16 candles, with a consumption of only 3½ cubic feet of gas per hour; and this, any gas engineer would tell them, it was impossible to fulfil under such conditions, unless the Company distributed gas of something like 21-candle power. In consequence of this, all negotiations for that contract, direct and indirect, were broken off. On the 29th of June, 1892, a new advertisement appeared, asking for tenders for lighting by gas or electricity. By the light of the experience the Board had acquired during the previous protracted negotiations (which caused a large expense), they came to the conclusion, after due consideration, that it was not practicable for the Directors to recommend the shareholders to make any tender under this advertisement. The tenders were returnable for Nov. 30 last; but (probably owing to the inconvenience then caused to all parties by quarantine) the time was extended to Dec. 30. The Directors being afraid that the authorities might think the Company were unwilling to light Pará even on reasonable terms, the Chairman embodied the views of the Board in a letter to the President of the Municipal Council, setting forth also what their experience had been in the past, and the terms and conditions under which it would be possible to light the city and ask the shareholders for further capital, in order to avail themselves of modern improvements, so as to make the lighting equal to that of London. This letter was expressed so tersely, and it would most likely be published in Pará in the *Diario Officiel*, that he thought it only right and proper the shareholders should hear it.

The SECRETARY read the letter, which was as follows:—

Nov. 28, 1892.

SIR,—I have the honour to address you on behalf of the Pará Gas Company, trusting that your Excellency and the Municipal Council may be willing favourably to consider the position of the Company with regard to the future lighting of the City of Belem, in the province of Pará.

Your Excellency is no doubt aware that the concession under which the Pará Gas Company has lighted the City of Belem since the year 1862, terminated on the 4th day of October, 1892, and that it was mutually agreed between the Camara of Pará and the Gas Company that the Company should continue to light the city on the terms of the same contract for a further period of one year, with the option, on the part of the Camara, of extending such period for another year. Under these arrangements, therefore, the obligations and privileges of the Company would definitely terminate, in any case, in October, 1894; and it has been deemed expedient by the Municipal Council of Belem to invite tenders for continuing to light the city on the completion of the Company's term, and to issue an advertisement to that end, embodying the conditions on which such tenders should be framed. The Board of Directors of the Pará Gas Company (of which I have the honour to be Chairman) has very anxiously devoted itself to the due consideration of this advertisement; and, though feeling every desire to continue its relations with the Municipal Council of Pará, have most reluctantly come to the conclusion that, under the terms of the advertisement, they are quite unable to frame a tender which would give any promise of a profit on their undertaking, and which they could therefore feel justified in recommending their shareholders to issue, or indeed for the support of which they could have any expectation that capital would be subscribed in the City of London. The Board of Directors feel that, having arrived at this conclusion, it is due in courtesy to your Excellency and the Council that you should be apprised of it; and I trust I may be pardoned by your Excellency if I venture to amplify, for your consideration and that of the Council, some of the circumstances which have materially influenced the decision of the Board.

Your Excellency will no doubt understand that, for the due fulfilment of the contract, under which the Company have hitherto lighted the City of Belem, it is necessary to convey coal and other material employed in the manufacture from England; and whilst it is imperative that all material should be punctually shipped and landed as promptly as possible in Pará, the payments on account of the material itself, and of the freight to Pará, as well as all the cost of labour and other incidental expenses are required to be met with extreme punctuality on demand. Your Excellency will see, therefore, that, unless the Company be absolutely secured for the prompt payment of its dues, it is extremely difficult to discharge its liabilities, and at the same time to find itself in possession of sufficient funds to carry on its undertaking on a liberal scale; and the Board has unfortunately found itself in great difficulties at different periods, owing to the payments due from the authorities being in arrear, whilst our creditors have been in a position to require immediate satisfaction.

Further than this, I beg to call your Excellency's attention to the fact that, although a fixed rate of 27d. per milreis was settled in their contract as the rate at which payments should be made by the Government, the delay in the payment after the settlement of their accounts has hitherto occasioned heavy loss to the Company by reason of the fall in the rate of exchange in Pará for bills on England. These are matters which, whilst quite beyond its control, have, as your Excellency and the Council will readily appreciate, very seriously affected the financial position of the Company, and induce it to hesitate before again embarking capital under like conditions.

I have yet, however, to beg the attention of your Excellency and the Council to the system of levying fines, which, though seemingly a just method of penalizing any inefficiency in the lighting obligations of the Company, has been found in practice to work with extreme hardship to the Company, and which, whilst it has seriously crippled its finances, has greatly tended to discourage its enterprise in the introduction of mechanical improvements in its system of lighting. I must beg your Excellency and the Council to believe that the Company is perfectly willing to submit to reasonable penalties for the non-fulfilment of the terms of its contracts; but, at the same time, I would earnestly urge that the imposition of fines for these *laches* on the mere arbitrary decision of the officers of one of the parties to the contract, is not only unjust to the other party, but is not in accordance with the modern system, which obtains in all European cities, of submitting such deficiencies to the arbitrament of a perfectly independent and automatic mechanical test. I submit to your Excellency that the system which is adopted by the authorities of checking the light given by the Gas Companies in London is put in force at the works of the companies, where the production of an efficient light is under their due control, and not, as in the City of Belem, at the burner in the street, which may be subject to tempest and other climatic conditions beyond their control.

Your Excellency and the Council will, I trust, accept my assurance that I bring these matters to your notice with no desire to make irritating complaint on behalf of the Pará Gas Company, but as an explanation of the course which the Board of the Company have reluctantly found it necessary to adopt in abstaining from tendering for a new concession as invited in the advertisement issued by your Excellency's Council.

It may possibly not be within the knowledge of your Excellency that for *some time* the Company has been carrying on its business and fulfilling its obligations under its present contract so crippled for funds, owing to the causes mentioned above, that no profit has been earned, and therefore no dividend paid to its shareholders since the 30th of September, 1890, when only 2 per cent. for the whole year was divided; and the Board, therefore, feel that it would be idle to invite subscriptions for capital to carry on the undertaking for a further term, unless more liberal terms are conceded by your Excellency's Government for securing prompt payment of its accounts, or for indemnifying the Company in case of loss through delay in such payments, and, further, for the exaction only of such just penalties as may be incurred through the lapse of conditions under the Company's own control.

I would venture, however, respectfully to submit to your Excellency that the Company is most willing—indeed, most anxious—to renew its business relations with the Camara of Pará, provided such terms should be agreed upon as would give to the Company a reasonable promise of earning a fair profit on its undertaking; and I would further beg to advise your Excellency that the Company earnestly desires to do its utmost to light the streets of Belem as efficiently as the streets of London or of Paris are lit, and in conformity with the growing importance of the city. To effect this, however, your Excellency will, I trust, perceive, from the remarks which I have ventured to address to you, it is imperative that the Company should have the command of sufficient funds to enable it to avail itself of every improvement in apparatus and machinery, and whilst it would earnestly endeavour to meet the wishes of the Camara, and to do itself credit in giving a light similar to that of London, it would require at the same time to be subjected only to such restrictions as modern science has commended for adoption in London.

The Board is, of course, unaware whether other parties have tendered for a concession to light the City of Belem, in conformity with the advertisement. But should it be found that there are no such tenders from other parties, or that such tenders as may be submitted are unacceptable to your Excellency's Government, your Excellency may be assured that the Board of the Pará Gas Company will be willing to enter into negotiations for a renewal of its contract, should your Excellency's Municipal Council be disposed to concede the restrictions which at present so fetter the Company; and I would venture, in conclusion, to undertake, on behalf of the Company, that no effort would be spared on its part to fulfil its obligations to the thorough satisfaction of the authorities and of the people of Pará.

I have the honour to be your Excellency's obliged and humble servant,

(Signed) ULICK J. BURKE, Chairman.

The CHAIRMAN (continuing) said that their Manager had instructions not to deliver this letter until the time for lodging the tenders was actually at an end. When tenders were invited on the first occasion, a deposit of £3000 was asked for; and only their own tender was sent in. In the second advertisement, no deposit was required; and then there was one tender for gas, one for gas and electricity, and two for electricity. To start a fresh company to light Pará, a large amount of capital would be needed; and therefore the tenders did not cause the Directors any great alarm. Even if another Company found the capital, and attempted to light the city on the same terms as they had been lighting it, without the protection asked for in the Chairman's letter, they could not make a good thing out of it. The tender for lighting by gas and electricity was sent in by a German firm; and those for lighting by electricity, he believed, had emanated from American firms. There was no doubt whatever that there were any number of people who would supply the machinery for lighting Pará by electricity; but whether they would find capitalists to furnish the money was a different thing. What they did know was that it would be a very difficult matter to light a town like Pará (where they had from 1700 to 1800 lamps spread over 40 miles of streets) with electricity at a profit. There was only one Electric Lighting Company that he knew of, very favourably situated in London, which paid a dividend; and he believed this was the solitary example of a successful electric lighting undertaking. If they were unsuccessful in getting the contract, they would have to wind up their affairs; and the best thing the parties who received the contract could do would be to buy up the Company's land, which had been considerably improved. Speaking of the present position of the Company, the Chairman remarked that they had, of course, nothing to do with the politics of Brazil; but he must say that since the Republicans had come into power, a large part of the arrears for lighting had been paid. The position of Brazil was improving; and consequently the prosperity of Pará was increasing. As the shareholders were aware, their contract expired last year; but strong pressure was put upon the Directors to renew it for a time. This they did, and the extension would terminate on Oct. 4 next; but the Government had the option of further prolonging it until Oct. 4, 1894,

by giving three months' notice. It was more than probable they would do this, because, should the contract be given to another party, it would be almost impossible for them to erect works and lay mains in a shorter time than that. As to the accounts, it would be seen that they had had to spend a great deal on the works to maintain them in a condition to meet the demands made upon them. Besides this, it was very difficult to work at a profit at the present rate of exchange. When Mr. Rumball was in Pará in August, 1891, the exchange stood at 17d.; while at present it was only 13¼d., though it was higher than it had been. Almost everything was now imported into Brazil, and the price of all commodities had gone up; and this had resulted in the Company having to pay a great deal more for labour. Having mentioned that the monthly accounts for lighting had been paid more punctually, the Chairman referred to the question of the fines imposed for defects in the public lights. In this connection, he stated that they had been informed (though he could not say it was so positively) that some of the burners had been removed from the lamps; but whether this was due to mischief or malice, he could not say. In conclusion, he appealed to the shareholders to support the policy of the Board.

Mr. C. W. C. GIVENS seconded the motion.

Mr. LAMBERT addressed the meeting at some length; and in the course of his remarks, he inquired whether, in the event of the Company being granted a fresh concession, they would have to reduce the price of the gas. Should this be the case, he failed to see how (looking at the present position of affairs) they would be able then to show a profit at all, unless there was some considerable reduction of the expenses, or an improvement in the manufacturing results. This was a very serious question for the shareholders; and he could not help thinking that it was entirely a matter of negotiation with the authorities of Pará. He had no doubt in his own mind that, if the Directors could offer the authorities some inducement, they would be able to come to an agreement.

The CHAIRMAN pointed out that, under the Company's original contract, they had to supply gas of 10-candle power. The Municipality, however, now wanted 16-candle gas; and it was impossible to supply this at the same price. Therefore a reduction was altogether out of the question.

Mr. SMITH remarked that the Company had been so badly treated in the past, that he strongly approved of the decision of the Directors not to enter into a fresh contract, unless they could see their way to the earning of a satisfactory dividend.

The SECRETARY, in reply to questions, stated that the Company were paid 200 reis per lamp per night for the public lighting; and they received payment half in gold and half in currency from private consumers. The works were situated 1½ miles from the city, which was extending in that direction. He furnished details of the cost of coal landed in Pará, and gave particulars as to freight, insurance, &c., paid.

The motion was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. RUMBALL, a dividend at the rate of 7 per cent. per annum, less income-tax, was declared on the £5 per share called on the preference shares.

The retiring Directors (Messrs. Givens and Burke) and the Auditor (Mr. P. Crellin) were re-elected.

The services of the Directors were suitably acknowledged, on the motion of Mr. T. GUYATT, seconded by General TUPPER; and the proceedings then terminated.

BIRMINGHAM CORPORATION GAS SUPPLY.

The Gas Committee's Half-Yearly Report.—The Increased Railway Rates and the Carriage of Coal and Coke.

At the Meeting of the Birmingham City Council to-day, the Gas Committee will present their report on the working of the department in the half year ending Dec. 31 last. It is stated therein that, notice having been received from the railway companies, about the middle of December, of alterations in rates prejudicially affecting the Corporation as regards coal and coke delivered over rail, the Committee at once terminated all contracts, both for the purchase of coal and sale of coke, in which provision had been made for such termination under the circumstances. As regards coal, the Committee report that the result of the changes made by the railway companies will not immediately affect the department; the coal-owners, in order to maintain existing contracts, having agreed that no increase in the rate shall prejudicially affect the price to be paid by the Corporation for coal under the contracts running to the 30th of June next. With respect to coke, the immediate result has been to largely reduce the quantity hitherto sold over rail. As, however, the Committee were in a favourable position as regards stocks on the 31st of December, they do not anticipate any difficulty as to the disposal during the coming summer of the coke which would otherwise have been delivered over rail on contracts made in the autumn. The Committee report that, during the pressure on the supply in the winter of 1891-2, it was found that some further provision was required to meet the increasing demand for gas for heating purposes and motive power in the northern part of the district, more especially in the locality known as "the jewellers' quarter." On investigation, it has been found that this is caused by the very large consumption which has to be supplied within a comparatively small distance from the Windsor Street works; thus leading to lower pressures than are desirable in the mains at a greater distance from the works. A similar difficulty has been experienced in other places. In order to provide for this increased demand, the Committee have authorized an expenditure of £8500 in the coming summer on additional and enlarged trunk mains from the Windsor Street works. The sale of gas for the half year was 2,019,775,500 cubic feet, as compared with 1,900,064,600 cubic feet in the corresponding half of 1891—an increase of 6·33 per cent.

Roystone Water Supply.—The Barnsley Corporation have agreed with the Barnsley Rural Sanitary Authority to supply the inhabitants of Roystone with water. The scheme has been approved, and the Local Government Board have sanctioned a loan of £4000 in order to carry out the scheme; and the work has now commenced.

THE PROPOSED AMALGAMATION OF WATER-GAS COMPANIES.

In continuation of our record of the movement which has been set on foot for consolidating the North British Water-Gas Syndicate, the British Water-Gas Syndicate, and the Yorkshire and Lancashire Water-Gas Company, we notice below the circulars which have lately been issued to the shareholders by the Directors of the two last-named Companies.

The circular from the British Water-Gas Syndicate states as follows: "At an informal meeting of the shareholders of this Syndicate, held at the Great Northern Hotel, Leeds, on Dec. 16, 1892—Samson Fox, Esq., in the chair—the outlines of a scheme for the amalgamation of this Syndicate with the North British Water-Gas Syndicate and the Yorkshire and Lancashire Water-Gas Company were explained by the Chairman. The two last-mentioned Companies entered into agreements with this Syndicate, by which they undertook to pay certain sums of money in consideration for the licences granted to them respectively for the exclusive right to develop the use of water gas in certain districts. At the present time, the amount overdue from the North British Syndicate to this Syndicate on capital account is about £49,300, exclusive of interest; and from the Yorkshire and Lancashire Company, £15,000, also exclusive of interest. It is only by the indulgence of this Syndicate that full payment has not been pressed, and the execution of the agreements enforced; for, as the Directors have been advised, any resistance by the sub-Companies, or by any section of their shareholders, to the fulfilment of existing agreements with this Syndicate, could but result in favour of the latter, though possibly only after thousands of pounds had again been spent in litigation, and the cause of the water-gas undertaking again thrown back even further than it has been already by legal proceedings. It has, however, been felt by the Directors, in view of the unforeseen difficulties and delays in the application of water gas, that many of the shareholders in the three Companies would be glad to be relieved of their liability to pay up their shares in full; and it was not overlooked that many of the shareholders in this Syndicate are also shareholders in the sub-Companies. At the same time, the Directors recognized that their belief in the ultimate success of the undertaking is shared by many of the members; and it has for some time past been the anxious desire of the Directors to formulate a scheme which should meet the difficulties of the position. After careful consideration, the Directors, without prejudice to the rights of this Syndicate to enforce full payment from the North British Syndicate and the Yorkshire and Lancashire Company, have, in concert with the Directors of these sub-Companies, decided, in the interest of the enterprise, to prevent further conflicts, and have, subject to ratification by the shareholders, agreed upon a scheme of amalgamation, as settled by the eminent Company Counsel Mr. Francis B. Palmer, which gives each shareholder in the three Companies an interest in the future of the business, while obviating the necessity of a call to any large extent. By this scheme it is proposed to form a new Company, in which the interests of the three present Water-Gas Companies will be merged, after a call has been made of 10s. per share on the unpaid capital of the sub-Companies. The liability of £1 per share on the shares of this Syndicate will be extinguished, and also the further liability of £1 10s. per share on the shares of the sub-Companies. All the assets and liabilities, except the uncalled capital, in each Company, will be handed over to the new Company; and the Company will undertake to pay all the costs and expenses of the voluntary winding-up of the three Companies, which it is proposed shall follow on the necessary agreements for the transfer of the undertakings becoming absolute, and indemnify the shareholders against any further liability."

The arrangement for the division of the capital of the new Company among the three existing Companies, as set forth in the JOURNAL for the 24th ult. (p. 148), is then explained; and the Directors pass on to allude as follows to the action of the dissentient shareholders in the North British Syndicate: "Mr. G. F. Allan, Solicitor, of Glasgow, and a holder of some 220 shares in the North British Water-Gas Syndicate, for which he appears to have paid altogether £49, has issued a circular on behalf of some dissentient shareholders in the North British Syndicate, proposing to resist the claim of this Syndicate; but these shareholders will indeed be ill advised if they undertake to meet the legal expenses which such resistance will involve. The fact of water gas not yet having been successfully demonstrated at Messrs. Spencer's for steel melting in their 30-ton furnaces, and at the Glasgow Iron and Steel Company for puddling, is to be deplored; but this is foreign to the question of liability under the amended agreement of the North British Syndicate with this Syndicate, which was entered into after the most careful consideration. The money now held by the North British Syndicate is, as a matter of fact, the property of this Syndicate, on account of the overdue balance.

After referring to the opposition of certain shareholders in the British Syndicate, the Directors discuss the possibilities of the future success of water gas. On this matter they make the following remarks: "As a matter of fact, there can be no doubt as to the varied and successful applications of water gas in foreign countries, nor as to the progress made in this country for welding, steel melting, singeing, and lighting, in the district of the Yorkshire and Lancashire Company, whose efforts, aided by this Syndicate, have done much towards making water gas the success your Directors are convinced it will ultimately become. In the month of March, 1891, Sir Henry Roscoe and others, on behalf of this Syndicate, visited all the chief European centres at which water gas is used. They report that at Essen it is used for welding corrugated and plain flues, for lighting, and for driving gas-engines, with unqualified success; that at Hoerde it is used for steel making, for puddling, reheating furnaces, and crucible steel furnaces, and that at this place it is also an unqualified success; that at Furstenwalde, at Messrs. Pintsch's, it is used for welding steel plates for large marine buoys, for soldering and brazing gas cylinders for railway carriages, for lighting, for driving gas-engines, for an annealing furnace for glass blowing and the manufacture of electric lamps; and that at the time of their visit a larger water-gas plant was

being erected, and this fact of itself proved the satisfaction of Messrs. Pintsch; that at the Frankfort Gas-Works, water gas is employed for the purpose of power in the works and for supplying the adjoining works (metal reduction) of the Frankfort Gold and Silver Reducing Company; that at Konigszelt, it is used for lighting the railway station and sidings, and the installation is a perfect success; and that at Gandersdorf, it is employed for lighting, heating, brazing, and gas-engine driving, and that it here gave entire satisfaction. The Directors are informed that a plant has since been erected at the Government works at Kiel, where water gas is used in the manufacture of torpedoes; and, further, that it has been adopted in Germany for the manufacture of phosphor bronze. Quite recently, one of the largest firms of tube makers in Scotland have ordered a water-gas plant for tube welding, after having seen the system at the Lancaster Waggon Company's works, where it is used for welding wheels. The difficulty with water gas lies in its application; and here, as stated by an American writer, much has been accomplished, while the future is fruitful of certain realization. In regard to the steel-melting plant at Newburn, it must be borne in mind that the application of water gas to such large furnaces is a new departure. In other industrial work, obstacles of as serious a nature have been encountered and overcome; and your Directors are convinced that this plant will yet be made a great success. The same remarks apply to the puddling furnace at Glasgow. The Directors believe that the new Company, with harmonious working and a central organization with reduced expenditure, will be able to carry out successfully what the present Companies have begun."

The Directors of the Yorkshire and Lancashire Company, in their circular, explain the consolidation scheme, and commend its advantages to the favourable consideration of the shareholders.

The Committee of the dissentient shareholders of the North British Syndicate also sent out a circular announcing that a meeting would be held last Wednesday to consider the position of affairs. It was signed by Mr. G. F. Allan; and it stated that the number of concurrences in the steps intended to be taken by the Committee, in the interests of the shareholders, was very gratifying. An eminent Counsel, intimately connected with the relations of the Companies, had been consulted, and had given an exceedingly favourable opinion on every point. The meeting took place in due course; and a resolution was unanimously passed instructing the agents to proceed on the lines indicated in the circular, and oppose the projected amalgamation.

NEW WATER-WORKS FOR PRESTON.

Local Government Board Inquiry.

The Preston Corporation having applied to the Local Government Board for permission to borrow £95,500 for the construction of new water-works, Colonel J. O. Hasted, R.E., held an inquiry into the matter last Thursday. The Borough Treasurer (Mr. J. Carter) first informed the Inspector that the proposed expenditure would in no way increase the price of water, as the Corporation were in the proud position of having a sufficient surplus to cover any extra expenses. The income from sales, water-rates, and rents in 1872 was £16,301; in 1882, £18,472; and in 1892, £20,208—the net profit during the latter year being £3576, and this, notwithstanding the fact that several large consumers, including the railway companies and the county authorities, had, during recent years, taken their custom from the Corporation. The total amount of borrowed capital sanctioned up to now was £320,225, of which £30,580 had been repaid, leaving £289,645 outstanding. Towards the repayment of their debts, the Corporation set aside each year the sum of £2352. The last loan on water-works account was the sum of £40,000 in 1875; and they now sought to borrow a further £95,500 for a much-needed improvement in the supply of water to the town. The Borough Engineer (Mr. H. Reah) submitted plans, and entered exhaustively into the details of the proposed scheme. He pointed out that the population of Preston was about 109,000; but that the water-supply district included a portion of Walton. At present the Corporation had three reservoirs on the gathering-ground of the Langden and Hareden Fells, just beyond Longridge, which had a total capacity of 253,000,000 gallons—the Spade Mill reservoir, 110,000,000 gallons; the Alston reservoir, 84,000,000 gallons; and the Grimsargh reservoir, 59,000,000 gallons. For some time past, there had been grave complaints by the ratepayers as to the inadequate pressure from the mains, which varied considerably, being frequently no more than 26 lbs. at noon and 38 lbs. at nightfall. Under the Local Improvement Act of 1869, the Corporation had been restricted in respect of the Alston reservoir to the appropriation of one-half the gross volume of the water coming from the Langden and Hareden brooks, or not more than 6,300,000 gallons in 24 hours; the daily consumption of the town being 3,250,000 gallons. The chief difficulty had been the lack of accommodation for storeage purposes; and the Inspector's attention was called to the fact that, on wet and stormy days, vast quantities of water coursing down the hill sides were allowed to pass away as waste. It was to remedy this evil and to increase the dimensions of the outlet-pipes (that at Alston, which fed the town, at present being only 10 inches) that the Corporation were now seeking powers to lay down a 36-inch main from the Grimsargh and Alston reservoirs to Acreage Lane, Preston, to erect a straining-chamber at a total cost of £35,500, and to construct a new reservoir in the immediate neighbourhood of that at Alston, which will hold another 275,000,000 gallons, or more than double the reserve. This latter part of the work, with the diversion of the present Loud conduit and other minor operations, was to cost the remaining £60,000 of the £95,500 proposed to be borrowed. The reason assigned for the laying of a 36-inch main was that the present main, which was laid in 1856, was only 26 inches in diameter, and was utterly inadequate to meet the requirements of a steadily growing population. At the present moment there was storeage for two months' supply; and it was proposed to make it four months. The Borough Engineer, in reply to questions, said he considered this new reservoir was absolutely necessary. The Inspector, having carefully gone through the plans, and drawn attention to the fact that there was no opposition, proceeded to view the site of the proposed works.

NOTES FROM SCOTLAND.

From our own Correspondent.

Saturday.

A somewhat formal, and not very instructive, meeting of the Edinburgh and Leith Gas Commission was held on Monday. The Engineers reported an output during December of nearly 209 million cubic feet (an increase of over one million cubic feet upon the output in December of 1891), which Mr. Kinloch Anderson, the Convener of the Works Committee, called attention to with an air of satisfaction. The same Committee reported that they had appointed a Sub-Committee to "consider and report how the Commissioners could best let the public know the proper burners to be used in consuming the gas they supply;" and that they had requested a Committee of their number "to take into consideration the best means of promoting the business of the sale and hire of gas cooking-stoves." Whatever the reports of these Committees may be, it would not be out of place if the Works Committee were to make both of the objects of inquiry permanent duties attaching to their office. The Commissioners, it was stated, have lent £17,556 to the Water of Leith Purification and Sewage Commissioners, on two different occasions; and power was given to the latter body to make the second mortgages rank equally with the first. The affair is a mere matter of form. The money is part of the £26,000 odd of the Commissioners' sinking fund; the balance of £8304 being lent to the Edinburgh Water Trust on mortgage.

The Dundee Gas Commissioners, when they recently contracted for about 18,000 tons of coal, included in the contract 2000 tons from the North of England. The contract for these was conditional upon their producing certain results. It has been found, on testing by Mr. M'Crae in the works, as well as by the Analyst, that the results expected have not been given; and the Commissioners, at their monthly meeting on Wednesday, resolved to cancel the contract, and to substitute Scotch splint for the English variety.

It was reported, at a meeting of the Glasgow Town Council on Thursday, that the electric lighting installation there is so far completed that current may now be supplied to as many incandescent lamps as they get orders for. The new station which the Corporation have erected is not yet finished; but it will be very shortly. At the station, the street lighting plant will be ready as soon as the lamps are in position. When all is done, it has been arranged that Lord Provost Bell is to turn on the light.

It is to-day announced that, as I expected, the Electric Light Committee of the Edinburgh Town Council have resolved to take further professional advice before coming to a decision whether the Corporation should work the proposed installation themselves or hand it over to a company. There need be no doubt as to the advice they will get. Electrical experts are too astute gentlemen not to know the advantage which there is to them of working under a corporation as compared with a company.

Mr. J. M. Turnbull, chemist, of Edinburgh, who last winter prepared a most exhaustive report for the Edinburgh Merchants' Association upon the gas supply of the city, has turned his attention to electric lighting. On Wednesday night, he began the reading of a paper before the Association on "The Comparative Cost of Electric Lighting and Lighting by Gas." Unfortunately, on account of the late hour at which the subject was reached, there was not time for him to finish his communication; and his reading of it was stopped short when he had only touched upon one point. It is, however, to be completed at the next monthly meeting. Mr. Turnbull does everything thoroughly; and this paper is a most complete *exposé* of some of the positions taken up by the promoters of electric lighting which I have seen. He opens with the remark that, on account of the public knowing little of the subject, a great deal of sentimental nonsense and humbug is talked to them, which he expects will disappear in time. The question of cost they evade neatly; and, as an illustration, he quotes from the prospectus, issued in December last, of a company which proposed to undertake the supplying of electricity in Coatbridge. In that prospectus, quotations were given from an address delivered by Mr. W. H. Preece, to the effect that "1 lb. of coal distilled into gas will give a light of 17·2-candle power, whilst, if converted into electrical energy, it will give 48 candles with a glow light, and 288 candles with an arc light;" and that "he was not paying more than when he had gas-burners." To show the misleading nature of these statements, Mr. Turnbull pointed out that gas was not the only thing derived from coal; and that in Edinburgh last year 26½ per cent. of the cost of coal was returned in the revenue derived from residuals. Proceeding to compare the cost of the two lights, he took the average charge for electricity in fifteen towns, and found it was 7½d. per unit. The charge for a 16-candle lamp for 1000 hours, at 7½d., would amount to £1 15s. To that figure he added the moderate estimates of 2s. 6d. for renewals, and 1s. 6d. for hire of meter, which made the total £1 19s. The charge for gas of 16-candle power, he averaged at 2s. 6d. per 1000 cubic feet; and of it 5000 cubic feet would require to be burned in 1000 hours to produce the same light as is given by a 16-candle incandescent lamp. But Edinburgh gas is of 26-candle power; and he took the equivalent light given by it at 3100 cubic feet, the cost of which would be in round numbers 12s. Electric lighting would thus be 3¼ times dearer than gas in Edinburgh. But, in addition, there was to be taken into account the rapid deterioration of the incandescent lamp, which necessitated more lamps being used; and when this was considered, the cost for electric lighting could not be less to the consumer, than four or five times that of gas. It will be difficult to controvert these figures. The misfortune is that, I suppose on account of the fact that gas lighting is old and familiar and electric lighting is young and mysterious, less interest is taken in such a method of treating the subject than would be were the figures to point the other way.

Your readers will recollect that on Dec. 13 last, I wrote that the *Scotsman* had just published the first of a series of articles upon electric lighting; and that on Jan. 17, I called attention to the fact that no others had appeared. I fancy I have the reason now. I learn privately that Mr. Turnbull wrote a letter to the Editor of the *Scotsman* which was of the nature of an exposition of the figures which the specialist put forward. Mr. Turnbull's communication has never been

published, although he has, since sending it, written pointing out the importance of the subject to the citizens. The Editor presumably could not afford to allow a distinguished writer to be contradicted in his columns; but having realized that Mr. Turnbull was right and the writer of the special article wrong, he put a stop to the series. That is perhaps good enough for newspaper management; but it is not assisting the public to make up its mind upon a subject which they have before them at present.

My attention has been called by a gentleman who is an authority upon both gas and coal matters, to the circumstance that, in a recent issue of the JOURNAL, it was stated, in the report on the Scotch Coal Trade, that the introduction of Mr. Young's oil-gas plant was affecting the sale of cannel coal. His opinion is that the price of cannel has been already reduced in consequence of the use of American patent carburetted water-gas processes in some of the largest towns in the kingdom. I gather from his remarks, that Mr. Young's process has the advantage over the other, in that it is applicable to small works, whereas the carburetted water-gas processes are only suitable for very large works, and that the employment of both will help to bring the price of cannel to that of common coal. He also points out to cannel merchants that, if they wish to retain their export trade, they must see that they ship the quality of coal they contract for; because it is largely on account of owners sending inferior coal, instead of cannel, that gas manufacturers are looking out for enriching agents.

In connection with Mr. Young's process, I mentioned last week that a resident in Peebles had written to the *Glasgow Herald* complaining of the sooty nature of the enriched gas. A writer in Monday's *Herald* replied to the complainer in much the same terms as the "Note" which I wrote last week. On Thursday, however, a letter appeared in the same paper from no less a personage than Mr. D. M. Nelson, of Glasgow, in which, without desiring to minimize or detract from the credit due to Mr. Young, he points out two features in the article which, he respectfully submits, will not stand scrutiny. The first is that "the results obtained are reliable and far in excess of those shown by any other process." He gives the information that there is another process which distils oil into gas quite as reliably as Mr. Young's, but saves the cost of distilling the shale into oil, inasmuch as it distils the shale into gas directly, and enables gas to be put into the holder at about 9½d. per 1000 cubic feet, instead of 1s. 1d. as calculated at Peebles. To that, I would reply that Mr. Nelson did not say where he knows of this gas at 9½d.; and that, though it might be quite possible to distil shale as he says if you had your shale delivered carriage free, it could not be used with the results he states if there were any considerable railway carriage to pay. It is one of the merits of Mr. Young's invention, that it enables a substance capable of being carbonized to be highly concentrated, and therefore carried cheaply, which gives a great advantage to gas-works not in the immediate neighbourhood of shale-fields. Mr. Nelson's second point is contained in the following passage: "The writer gives his readers a puzzle to solve, when he states that 'all the oil must be converted into gas or into coke.' Oil into 'gas' I quite understand; but 'oil into coke' is—well, improving worse, and quite beyond yours, &c." Mr. Nelson has overreached himself here. Sarcasm is a dangerous weapon to handle, unless one is fully acquainted with the facts he goes upon. In this case, Mr. Nelson is not. I can corroborate what the writer in the *Glasgow Herald* said about coke, for I have myself seen the charge drawn—a charge of most beautiful coke, entirely derived from oil, and produced at the rate of from 5 to 6 cwt. per ton of oil. It looks strange; and I understand it was a matter of surprise to Mr. Young himself, that so large a quantity of solid material could be obtained from a liquid, but it is nevertheless a fact.

The Paisley Gas Corporation on Monday agreed to proceed with their application for an Order in Council authorizing them to borrow £20,000 for the extension of the gas-works. I suppose the form of the Order is now finally settled. The Corporation have resolved not to make it a condition of the borrowing that they should write off £1000 a year for depreciation. They have, however, resolved to set aside £1000 a year, with interest added, to the sinking fund, which, it is calculated, will liquidate the new loan and the existing £74,000 of debt in 45 years.

Two gas companies announce their dividends this week—Coatbridge, where 10 per cent. is paid on the old, and 7 per cent. on the new stock; and Moffat, where 7½ per cent. is paid on the ordinary, and 5 per cent. on the guaranteed stock.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 4.

Sulphate of Ammonia.—There has been less demand this week; but there is no change in values. There is, in fact, such a small quantity on the market that, even if no orders came in for another fortnight, it would hardly affect prices. The bulk of the February production appears to be sold; and, as some of the consuming countries have as yet bought very little this year, the present dulness can hardly be of a lasting nature. Nitrate, too, being so strong, must have an influence on the course of the sulphate market; and there is to-day every prospect of an early season. To-day's quotations are: Hull, £10 8s. 9d. to £10 10s.; Liverpool, £10 10s.; Leith, £10 7s. 6d.

LONDON, *Feb.* 4.

Tar Products.—Generally speaking, this market is dull. Benzols are weaker; and buyers' ideas of values are considerably below Committee prices. The demand seems to have dropped off in a most unexpected manner; and the sales from Beckton have also tended to weaken this market. There is a little more inquiry for toluol; and its scarcity is probably due to the price of 50's being so near that of 90's. Carbolic and cresylic acids are firm; and large business for forward delivery has been done. Pitch is somewhat better; and contracts of considerable magnitude are mentioned. Ideas of the value of tar vary in a remarkable manner; and it is thought that the higher prices recently paid are not warranted by the future of the products market. To-day's values may be taken as follows: Tar, 11s. 6d. to 13s. 6d. Pitch, 26s. to 27s. 6d. Benzols, 90's, 1s. 9d.; 50's, 1s. 7d. Toluol, 1s. 5d. Solvent naphtha, 1s. 2½d. Crude benzol naphtha, 30 per cent., 8½d. Creosote, 1½d. Creosote salts, 18s. Carbolic acid, 60's, 2s. 6d.; 50's, 2s. 10d.; crystals, 8½d. Cresol, 2s. Anthracene, 30 per cent., "A" quality, 1s. 2d.; "B," 10d. nominal.

Sulphate of Ammonia.—Urgent buyers having covered their requirements, and as very little has been offered during the last few days, there has been breathing time; and prices are not quite so firm. Important business has been done at £10 10s.; but the market has since receded to a nominal quotation of £10 7s. 6d., less 3½ per cent. discount. Gas liquor is quoted at 7s. to 8s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is a continued quieting down in the demand for all descriptions of fuel; and the outlook for the coal trade of this district becomes, if anything, still more unsatisfactory. Even the better qualities of round coal are in very indifferent demand; and though quoted rates are nominally unchanged, there is already a decided weakening tendency in the market. Second qualities are in some instances being quoted at 6d. per ton under recent rates. At the pit mouth, best Wigan Arley does not average more than 12s. to 12s. 6d.; Pemberton four-feet and second qualities of Arley, 10s. to 10s. 6d.; and common house-fire coals, 8s. to 8s. 6d.; per ton. The position as regards the lower qualities, for iron-making, steam, and general manufacturing purposes, remains without any improvement. Supplies are largely in excess of requirements; and, either for inland consumption or for shipment, to clear away quantities promptly sellers in many cases are prepared to entertain almost any offers that buyers put forward. Nominally, 7s. at the pit mouth remains about the average price for inland sales; but this scarcely represents the actual selling price for quantities; while for shipment it is exceptional where more than 8s. to 8s. 3d. per ton is being obtained for ordinary descriptions of steam coal, delivered at the ports on the Mersey. Engine classes of fuel are beginning to hang more upon the market, especially in the lower qualities, and prices are easier. At the pit mouth, burgy averages 6s. to 6s. 6d.; best slack, 4s. 9d. to 5s.; medium, 4s. to 4s. 3d.; and common sorts (which in a good many cases are being quoted at 3d. under recent rates) are obtainable at as low as 3s. to 3s. 3d. a ton.

Northern Coal Trade.—The coal trade of the North is still extremely weak; and the large supply of coal causes prices to have a downward tendency, though milder weather has allowed the export trade to assume larger proportions. Best Northumbrian steam coal is still nominally 8s. 9d. per ton f.o.b.; but it is known that sales are taking place below that price. Second-class steam coals are quoted at 8s. per ton; and of both these and small steam coals the supply is abundant. For bunker coals the price is very weak, at from 6s. 3d. to 6s. 6d. for fair qualities; but for best unscreened Durham kinds, 7s. to 7s. 6d. per ton is asked. Household coals are quieter, and lower in price. Gas coals are now in less demand for local uses; but the export is a little larger, and counterbalances the falling off. It is difficult to quote the price of gas coals—about 6s. 6d. to 6s. 9d. per ton f.o.b. might be a fair average, though higher as well as lower prices are quoted. For coke the demand for blast-furnaces is good, and the export is also a large one; but there is only a moderate demand for gas coke. Prices of coke are unaltered.

Scotch Coal Trade.—A very confirmed depression has set in in Scotland. The home demand is exceedingly slack, with little prospect of brightening; but, in addition, the Continental ports are, with the exception of the Elbe, not yet open. Everything is in readiness to take advantage of the opening when it comes; steamers being loaded ready to sail as soon as the opportunity offers. The result is that stocks are accumulating at a rapid rate everywhere; and this is telling upon the miners, who, in some instances, are only getting two days' work a week. Splint coal has fallen to a price which it has not touched for four years. The gas coal trade remains unaltered, cannel being almost unsaleable. Prices are not to be relied upon, as under-quotations can be had. It is reported that the Fife and Clackmannan coalmasters have again reduced prices all round by 3d. per ton. Main is quoted at 6s. 7d. to 6s. 9d.; ell, 7s. 6d.; splint, 7s. 3d. to 7s. 6d.; and steam, 8s. 9d. per ton, all f.o.b. Glasgow. The shipments during the week amounted to 89,063 tons—a decrease of 26,910 tons compared with the previous week, and of 14,371 tons compared with the corresponding week of last year. For the year to date, the total shipments have been 363,552 tons—a decrease compared with the same period of last year of 40,873 tons.

Remarkable Artesian Boring.—A remarkable artesian boring has just been completed at Willoughby, in Lincolnshire. Owing to an inadequate water supply for the locomotives running on the Sutton and Willoughby Railway, the Company decided to bore. At a depth of 245 feet from the surface, the workmen struck upon a bed of ironstone, which took them a considerable time to penetrate; but beneath this rock a magnificent spring was met with. For some time the water threw out tons of blue sand; but it eventually cleared, and it now flows over a 2½-inch tube 30 feet above the ground, at the rate of 4619 gallons per hour, or 1¼ gallons per second. The spring is said to be the strongest yet obtained in Lincolnshire.

Defective Public Lighting through Frost.—At the meeting of the Hampstead Vestry last Thursday, a letter was received from the Distributing Engineer of The Gaslight and Coke Company (Mr. G. F. L. Foulger), referring to his interview with the Surveyor to the Vestry on the subject of the complaint as to the defective supply of gas to the public lamps in the parish. The letter stated that the stoppages had been caused by the severe frost; and it had cost about 2s. per stoppage for clearing. There had been 700 stoppages in less than three days. The Works Committee reported that they had considered the letter, and recommended that the Vestry Clerk be instructed to communicate with the Company with a view to a reduction being made for their Christmas quarter's account now before the Vestry. This course was approved of.

The Price of Gas in the Commercial Company's District.—A meeting of gas consumers was held in the Limehouse Town Hall on Monday evening last week, to protest against the increase of 5d. per 1000 cubic feet which has been made in the price charged by the Commercial Gas Company. Mr. Paton presided. The Rev. C. Sales moved—"That this meeting of gas consumers protests against the Commercial Gas Company's iniquitous proceeding in raising the price of gas 5d. per 1000 cubic feet, while paying a dividend of 15½ per cent." In the course of the discussion, a suggestion was thrown out by one speaker that the best thing for the meeting to do would be to send a deputation to the Company, who had no desire to raise their price, and would be only too glad to keep it down. The motion was carried unanimously. It was then moved—"That this meeting of ratepayers hears with satisfaction that the Limehouse District Board of Works is pursuing inquiries as to the advisability of lighting the district with electricity." This was also carried. Other resolutions, proposing to send a report of the meeting to the Company, and a request to the Limehouse Vestry to communicate with the different Vestries and Local Boards, with a view to a conference on the future lighting of the Metropolis, were also adopted.

The West Bromwich Gas Undertaking.—At the meeting of the West Bromwich Town Council last Wednesday—the Mayor (Mr. C. Akrill) presiding—the Gas Committee presented the following report: "The sales of gas for the quarter ending Dec. 31 last, were 72,538,600 cubic feet, as compared with 68,681,500 cubic feet for the corresponding quarter of the previous year. The amount of the gas-rental (exclusive of public lighting) was £8357 9s. 10d., as compared with £7896 13s. 1d. for the corresponding period. The various colliery owners supplying gas coal to your Committee have intimated that, in consequence of notice given by the railway companies, all coal from the 1st of January last will be carried by the statute ton instead of in 21 cwt. lots as at present, and that an allowance will be made of 2 cwt. per waggon for wastage. This alteration will increase the rate per ton; but your Committee are taking steps to induce the railway companies to make such concessions in the rate as will compensate for the altered conditions now notified." In moving the adoption of the report, Alderman Harley stated that the railway companies were now "climbing down," although they ought never to have tried to take advantage of the trade of the country. The Mayor considered the subject of such importance to the borough, that he proposed that the question be referred to the General Purposes Committee. This was agreed to.

Trial of the Pumping Machinery at the Cheshunt Water-Works—A special meeting of the Cheshunt Local Board was recently held at the Newgate Street pumping-station, for the purpose of witnessing the official trials of the now completed pumping machinery. They were conducted by Mr. T. Bennett, on behalf of the Board, and Mr. Thorn, of Messrs. Kates and Thorn, Canal Foundry, Blackburn, the makers. The contract was for each engine and pump to be capable of raising 500 gallons per minute through a rising main 10 inches in diameter, into a reservoir at a distance of 150 yards (the lift being 425 feet) with not more than 30 revolutions per minute. The first engine was started at 10.40 at 24 revolutions, with steam at 70 lbs. pressure; and the trials were brought to a close at 12.40. The speed was never increased beyond 24 revolutions; the actual quantity of water raised being 578 gallons per minute for each engine, or at the rate of 1,039,680 gallons per 24 hours when running full speed—that is, one-third in excess of the specified duty. At the conclusion of the trials, Mr. Bennett and Mr. Thorn were congratulated on the excellent results, and the satisfactory completion of the work. The whole of the works, which are now finished, embrace a deep well, engines, pumping-station, covered service reservoir, and about 17 miles of mains. They were designed by Mr. Bennett; the expenditure on them being £32,000.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 220.)

Issue.	Share	When ex-Dividend.	Dividend last Half-Year's Books.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	14 Oct.	10½	Alliance & Dublin 10 p. c.	10	17½—18½	+1	5 13 6
100,000	10	"	7½	Do. 7 p. c	10	11½—12½	+½	6 0 0
300,000	100	3 Jan.	5	Australian (Sydney) 5 % Deb.	100	104—106	..	4 14 2
100,000	20	30 Nov.	8	Bahia, Limited	20	11—12	..	13 6 8
200,000	5	16 Nov.	7½	Bombay, Limited	5	5⅝—6⅛	..	6 0 0
40,000	5	"	7½	Do. New	4	4—4¼	..	6 13 4
380,000	Stck.	12 Aug.	12½	Brentford Consolidated	100	215—220	..	5 11 4
150,000	"	"	9½	Do. New	100	165—170	..	5 8 9
220,000	20	15 Sept.	11½	Brighton & Hove Original	20	41—43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	103—106	..	4 14 4
320,000	20	29 Sept	11½	British	20	42—44	+1	5 2 3
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	"	8½	Do. 7 p. c.	10	14½—15½	..	5 9 8
328,750	10	—	—	Buenos Ayres (New) Limited	10	7—8	..	—
200,000	100	3 Jan.	6	Do. 6 p. c. Deb.	100	98-100	..	6 0 0
150,000	20	12 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	14 Oct.	13	Commercial, Old Stock	100	242—247	+2	5 5 3
165,000	"	"	10	Do. New do.	100	180—185	..	5 8 1
160,762	"	15 Dec.	4½	Do. 4½ p. c. Deb. do.	100	122—127	+2	3 10 11
800,000	Stck.	15 Dec	13	Continental Union, Limited	100	227—232	..	5 12 0
200,000	"	"	10	Do. 7 p. c. Pref	100	190—195	..	5 2 7
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185—190	..	5 5 3
486,090	10	27 Jan.	10	European, Limited	10	20—21*	..	4 15 3
354,060	10	"	10	Do. Partly paid	7½	14—15*	..	5 0 0
5,596,560	Stck.	12 Aug.	12	Gaslight & Coke, A, Ordinary	100	225—230	..	5 4 4
100,000	"	"	4	Do. B, 4 p. c. max.	100	95—98	..	1 1 7
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	263—268	+1	3 14 7
60,000	"	"	5	Do. F, 5 p. c. Prf.	100	116—121	..	4 2 7
30,000	"	"	7½	Do. G, 7½ p. c. do.	100	166—171	..	4 7 8
1,300,000	"	"	7	Do. H, 7 p. c. max	100	166—170	+1	4 2 4
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	262—267	+1	3 14 10
476,000	"	"	6	Do. K, 6 p. c. Prf.	100	154—159	+1½	3 15 6
1,061,150	"	15 Dec.	4	Do. 4 p. c. Deb. Stk.	100	120—123	..	3 5 0
294,850	"	"	4½	Do. 4½ p. c. do.	100	125—130	..	3 9 3
908,000	"	"	6	Do. 6 p. c. do	100	165—170	..	3 10 6
3,800,000	Stck.	16 Nov.	12	Imperial Continental	100	227—230	−1	5 4 4
75,000	5	30 Nov.	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	107—109	..	4 11 9
541,920	20	16 Nov.	5	Monte Video, Limited	20	14—15	..	6 13 4
150,000	5	30 Nov.	10	Oriental, Limited	5	8—8½	..	5 17 8
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4½	..	7 7 4
166,870	10	—	2	Pará Limited	10	2—2½	..	—
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	103—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	100-105	..	5 14 3
150,000	10	—	10	San Paulo, Limited	10	8¼—9¾	..	—
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	291—296	..	5 4 9
1,350,000	"	"	12	Do. B do.	100	241—246	+1	4 17 7
230,000	"	"	13	Do. C do.	100	245—250	..	5 4 0
750,000	"	13 Jan.	5	Do. 5 p. c. Deb. Stk.	100	143—146	+1	3 8 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
744,897	Stck.	30 Dec.	10	Chelsea, Ordinary	100	253—258	..	3 17 6
1,720,252	Stck.	14 Oct.	8	East London, Ordinary	100	211—215	..	3 14 6
544,440	"	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	141—144	..	3 2 6
700,000	50	15 Dec.	6½	Grand Junction	50	107—111	..	3 16 7
708,000	Stck.	12 Aug.	11	Kent	100	281—286	..	3 16 11
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	235—240	..	3 19 2
406,200	100	"	7½	Do. 7½ p. c. max.	100	194—198	−1	3 15 10
265,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	123—128	..	3 2 6
500,000	100	12 Aug.	12½	New River, New Shares	100	327—332	..	3 13 1
1,000,000	Stck.	27 Jan.	4	Do. 4 p. c. Deb. Stk	100	131-134*	..	2 19 8
902,300	Stck.	15 Dec.	6½	S'thwk & V'xhall, 10p. c. max.	100	162—167	−2	3 17 10
126,500	100	"	6½	Do. D 7½ p. c. do.	100	145—150	..	4 6 8
1,155,066	Stck.	15 Dec.	10	West Middlesex	100	247—252	..	3 19 5

*Ex Div.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." **GWYNNE & CO.,** TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

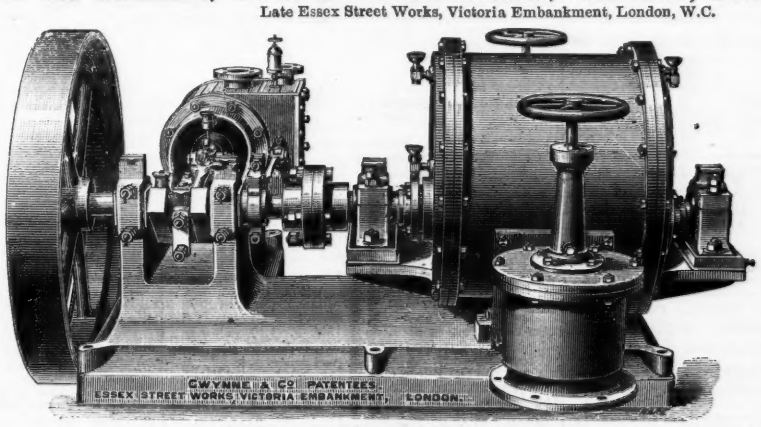
Late Essex Street Works, Victoria Embankment, London, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

YOUNG Man requires a Situation in an Office. Good Practical knowledge of Wholesale and Retail Gas Trade, Plumbers' Brass Work, and Electric Bells. Good References.
Address Box 206, Sell's Advertising Offices, LONDON.

ADVERTISER (aged 29) seeks a Situa. tion as STOKER in a Gas-Works. Accustomed to Engines and Exhausters, and willing to make himself useful. Total Abstainer; first-class reference.
Address No. 2186, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER seeks a Situation as STOKER in a small Gas-Works, or to look after a small Works as Stoker, without Fitting. Shovel charging preferred. Married (no family); age 33.
Address HENRY WILSON, 1, Fox's Yard, Southgate, Eckington, near ROTHERHAM.

GENTLEMAN (aged 28) desires ap- pointment as ASSISTANT MANAGER or CHEMIST. Thoroughly understands analyzing Coal, Gas, and Residuals. Good references.
Address No. 2188, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOREMAN Gas Stoker wanted. Must be a strong, willing young man, thoroughly competent, and used to Shovel Charging. Wages 30s. per week, with good House, Gas, and Water free.
Apply, in own writing, to J. C. ARCHER, Gas-Works, Bridlington, YORKS.

WANTED, in a Gas-Works within 50 miles of London, a respectable young Man as JUNIOR CLERK. Must be a neat and accurate writer, and have had some previous knowledge of Rental and Residual Accounts.
Address, stating age, salary required, and references, to No. 2187, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LANCASHIRE TAR PRODUCTS.

CAPITALISTS and Tar Distillers are invited to JOIN the ADVERTISER in buying existing Works, erecting new ones, and FORMING A COMPANY.
Wanted an experienced CHEMIST and MANAGER.
Apply to C. DASNIERES, 16, Philpot Lane, LONDON, E.C. (Twenty-two years' connection in the Tar Trade.)

ALDERSHOT GAS AND WATER COMPANY.

KIRKHAM'S Scrubber, with 8-inch Connections, and four 12 feet square PURIFIERS to be Sold.
Offers to be addressed to the HONORARY SECRETARY, at the Offices of the Company, 103, Victoria Road, ALDERSHOT.

CALVERT'S MECHANIC'S ALMANAC for 1893 (price 4d.) contains, besides other valuable matter—"PATENTS: SOME POPULAR DELUSIONS," by W. LLOYD WISE, Esq., J.P., C.C., Fellow of the Chartered Institute of Patent Agents.
MANCHESTER: JOHN HEYWOOD, Deansgate; and JOHN CALVERT, 99, Great Jackson Street. LONDON: JOHN HEYWOOD, 2, Amen Corner, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 245., of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

MR. J. C. CHAPMAN, Fellow of the Chartered Institute of Patent Agents, advises on all matters connected with LETTERS PATENT FOR INVENTIONS and the PROTECTION OF TRADE MARKS, &c., at home and abroad. Preliminary Information and Handbook on application.
70, Chancery Lane, LONDON, W.C.

FOR SALE—Rectangular Station Meter.
Capacity 19,000 cubic feet per hour; 12-inch Connections.
For particulars apply to W. E. PRICE, Gas-Works, HAMPTON WICK.

FOR SALE—A perfectly new 20,000 cubic feet per hour EXHAUSTER, with Steam-Engine combined, including Hydraulic Gas Governor, Bye-Pass Valves, and Connections.
For further particulars, apply to Mr. T. G. MARSH, 41, Corporation Street, MANCHESTER.

RETORT-BENCH MOUNTINGS FOR SALE.

IN consequence of extensions, the Stafford Corporation Gas Committee have FOR SALE the following RETORT-BENCH MOUNTINGS, which are in good condition, and will be sold cheap:—

56 Oval Retort Mouthpieces, 20 in. by 15 in., complete, with loose Steel Lids, Cross-Bars, and Screws.
56 6-inch Cast-Iron Ascension-Pipes, tapering to 5 inches diameter at top.
56 H-Pipes, 5 inches diameter inside, with three loose Caps on each.
56 5-inch diameter Dip-Pipes.
4 Lengths of Hydraulic Main, semi-circular bottom, size 25 in. by 24 in., made of ⅜-inch Wrought-Iron Plate, with ½-inch end and top Plate, each length being 19 feet long.
12 Cast-Iron Hydraulic Main Standards.
4 10-inch Gas-Valves.
13 Cast-Iron Wall Brackets for 10-inch Gas-Pipes.
10 Cast-Iron and 8 Wrought-Iron Buckstays, each about 12 feet long.

The above can be seen on application at the Gas-Works; and any further information may be obtained from the Engineer (Mr. J. F. Bell), Gas Offices, Stafford.
MATT. F. BLAKISTON, Town Clerk.
Feb. 1, 1893.

THE GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £50,000 ORDINARY "A" CONSOLIDATED STOCK.
MINIMUM PRICE, £220 PER CENT.

THE Directors of The Gaslight and Coke Company will be prepared to receive, not later than Twelve o'clock (Noon) on Monday, the 20th of February inst., TENDERS for £50,000 of NEW ORDINARY "A" CONSOLIDATED STOCK, such Stock to be paid up in full on or before the 27th of February inst., and the Dividend thereon to commence to accrue from the 1st of March next.
Any amount, being not less than £5 or a multiple thereof, may be tendered for; and the Stock will be registered in the Company's Books free of expense.
The Minimum Price has been fixed at the rate of £220 per £100 of Stock.
Forms of Tender, with full particulars and conditions, may be obtained on application at this Office.
By order,
JOHN ORWELL PHILLIPS, Secretary and General Manager.
Chief Office: Horseferry Road, Westminster, S.W., Feb. 1, 1893.

BOROUGH OF MACCLESFIELD CORPORATION GAS-WORKS.

THE Gas Committee of the above Cor- poration invite TENDERS for the construction and erection of the IRONWORK, &c., of a PURIFYING HOUSE, PURIFIERS, VALVES, and CONNECTIONS at the Gas-Works, Macclesfield.
The Drawings and Specification may be seen at the Gas-Works on application to Mr. J. G. Newbigging, Manager, and at the Offices of Mr. T. Newbigging, C.E., 5, Norfolk Street, Manchester.
Copies of the Bill of Quantities and Form of Tender may be obtained from the latter on deposit of Two Guineas, which will be returned on a *bond-fide* tender being sent in.
Sealed tenders, endorsed "Tender for Purifiers, &c., Contract No. 4," to be sent so as to reach me not later than Ten a.m. on Saturday, the 18th inst.
The Committee do not bind themselves to accept the lowest or any tender.
W. FREDERICK TAYLOR, Town Clerk.
Town Hall, Macclesfield, Feb. 1, 1893.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, Cathedral Chambers, Half Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; 10, Marsden Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

LIQUOR and Tar wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

MESSRS. JAMES & WILLIAM WOOD, Colliery Proprietors, beg to intimate that Mr. D. H. M'GEORGE IS NO LONGER IN THEIR EMPLOYMENT.

COUNTY BOROUGH OF WIGAN.

THE Gas Committee are prepared to receive TENDERS for Two PURIFIERS, with Connections and Centre-Valve, all fixed; also LIFTING APPARATUS.
Particulars may be obtained from the undersigned.
Tenders, endorsed "Purifiers," to be delivered to Arthur Smith, Esq., Town Clerk, on or before Monday, the 13th prox.
The Committee do not bind themselves to accept the lowest or any tender.
JOS. TIMMINS, Engineer.
Borough Gas-Works, Wigan, Jan. 23, 1893.

GASHOLDER AND TANK.

THE Directors of the Bruton Gas Com- pany are prepared to receive TENDERS, in One sum, for a GASHOLDER and BRICK TANK according to Plans and Specifications deposited at my Office for inspection.
Tenders, endorsed "Gasholder and Tank," must be delivered to me, free of charge, on or before the 1st day of March, 1893.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
WM. MULLER, Secretary.
Bruton, Feb. 1, 1893.

LEEDS CORPORATION.

TENDERS FOR FIRE GOODS.

THE Gas Committee of the Leeds Cor- poration solicit TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, FIRE-BRICK LUMPS, and FIRE-CLAY.
Particulars as to quantity, together with Forms of Tender, may be obtained from Mr. Lupton, Gas Department, Municipal Offices, Leeds.
Tenders, addressed to the Chairman at the above address, endorsed "Tender for Fire Goods," will be received not later than Wednesday, the 15th of February next.
The lowest or any tender will not necessarily be accepted.
Jan. 26, 1893.

THE Gas Committee of the Middleton Corporation invite TENDERS for two new PURIFIERS, ELEVATORS, &c., at their Gas-Works, Middleton.
Drawings may be seen and Specifications obtained from Mr. Duxbury, Gas Manager, Middleton, on depositing One Guinea with the undersigned, which will be returned on receipt of tender.
Tenders, addressed to the Chairman of the Gas Committee, endorsed "Purifiers," to be delivered at my Office, on or before the 15th day of February inst.
FREDERICK ENTWISTLE, Town Clerk.
Town Hall, Middleton, Feb. 3, 1893.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY RETORTS (machine moulded only), FIRE-BRICKS and CLAY, CAST-IRON MAIN PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, and SULPHURIC ACID, as may be required from the 1st day of April next to the 31st day of March, 1894.
Sealed tenders, on forms to be obtained at the Office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office, on or before the 21st inst.
The lowest or any tender not necessarily accepted.
By order,
C. F. PRESTON, Town Clerk.
Town Hall, Barrow-in-Furness, Feb. 2, 1893.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the ORDINARY GENERAL MEETING of the Proprietors of the above Company, will be held at the Company's Offices, North Street, Wandsworth, on Thursday, the 23rd of February next, at Five o'clock in the Evening precisely, for the purpose of a Declaration of a Dividend, the election of Directors and an Auditor, and the transaction of the General Business of the Company.

The Transfer Books will be closed on and from the 10th until the 23rd of February, both days inclusive.

By order,
WALTER CROMARTY,
Secretary.

Offices: North Street,
Wandsworth, Feb. 3, 1893.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Guildhall Tavern, Gresham Street, in the City of London, on Friday, the 24th day of February, 1893, at Half-past Twelve o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor, and to transact the General Business of the Company.

The Transfer Books will be closed from the 11th to the 24th of February, both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Feb. 2, 1893.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.

INCORPORATED BY ACT OF PARLIAMENT, 1867.

NOTICE is hereby given, that the FIFTY-SECOND ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 21st day of February, 1893, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor in place of those retiring by rotation, and for General Business.

The Transfer Books will be closed from the 6th inst. until after the Meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works: Merton Lane,
Mitcham, Feb. 4, 1893.

NOW READY.

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Sixteenth Annual Issue, 5s.

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Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

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Illuminating Power	16·3 candles.
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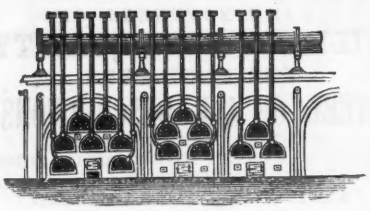

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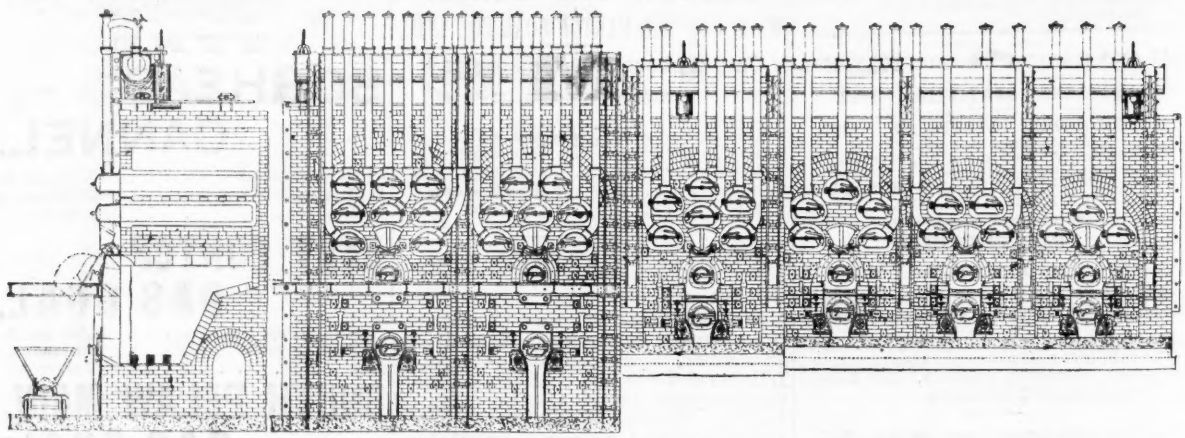

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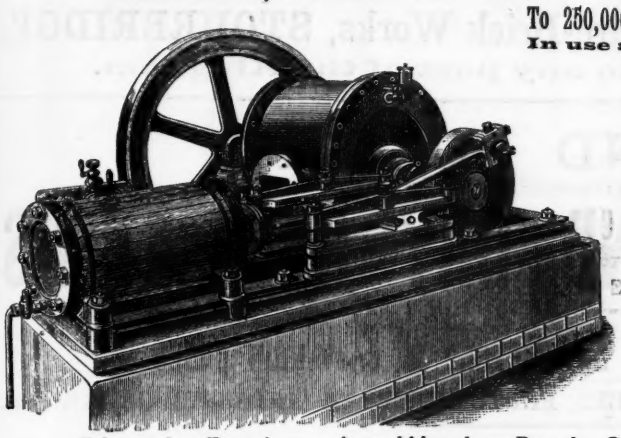

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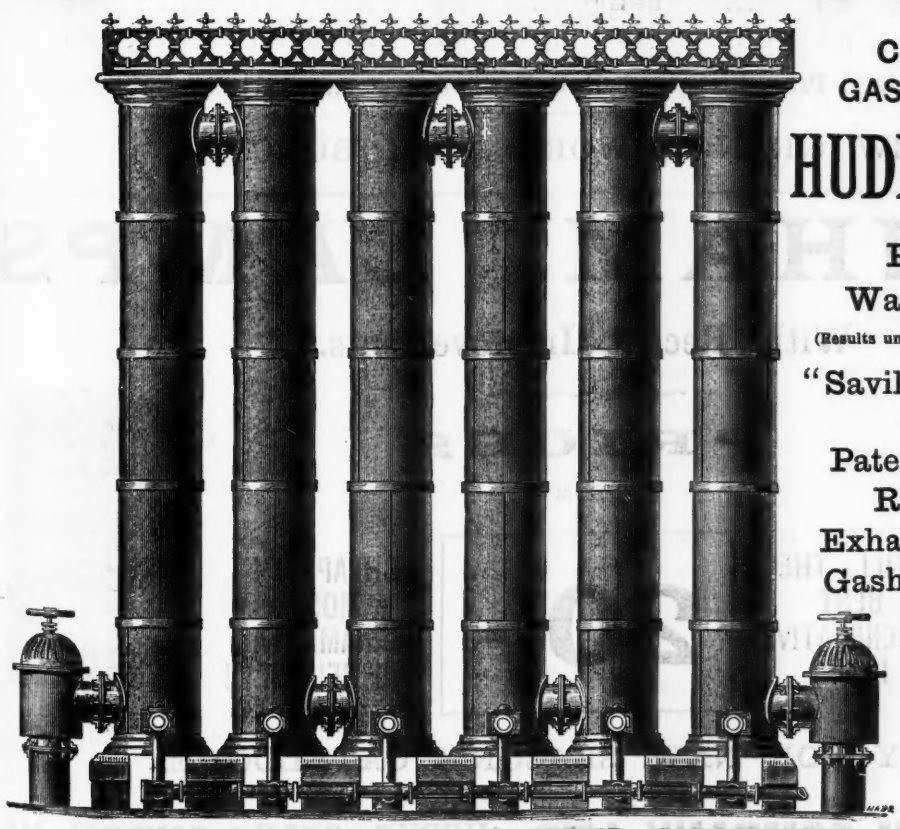

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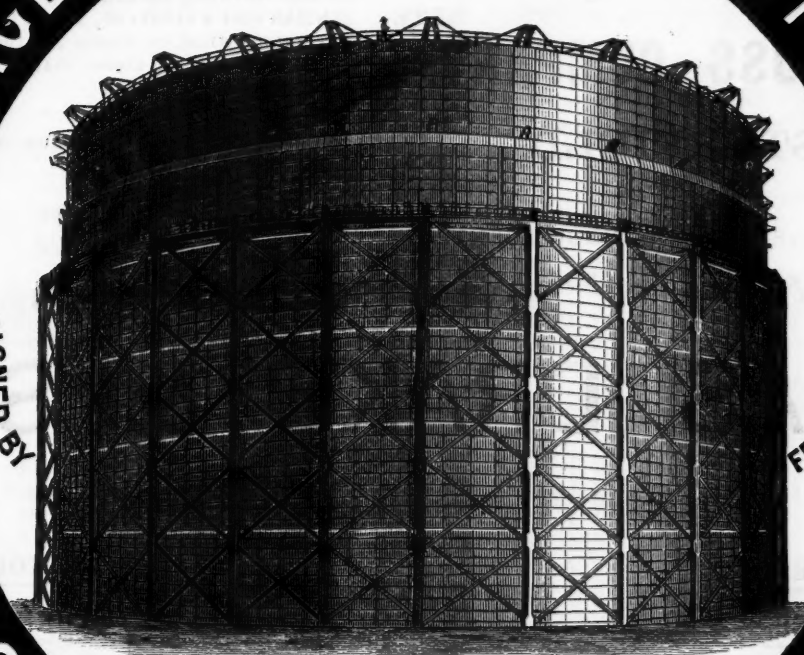

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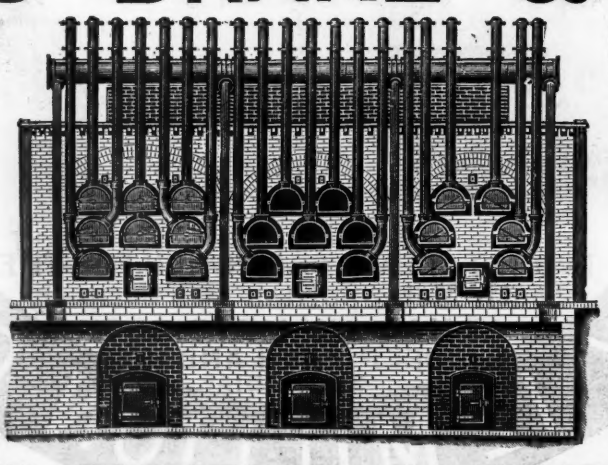

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(COPY OF A LETTER RECEIVED)

From **THE FORMBY GAS COMPANY, LIMITED,**
FORMBY, Nov. 11, 1892.

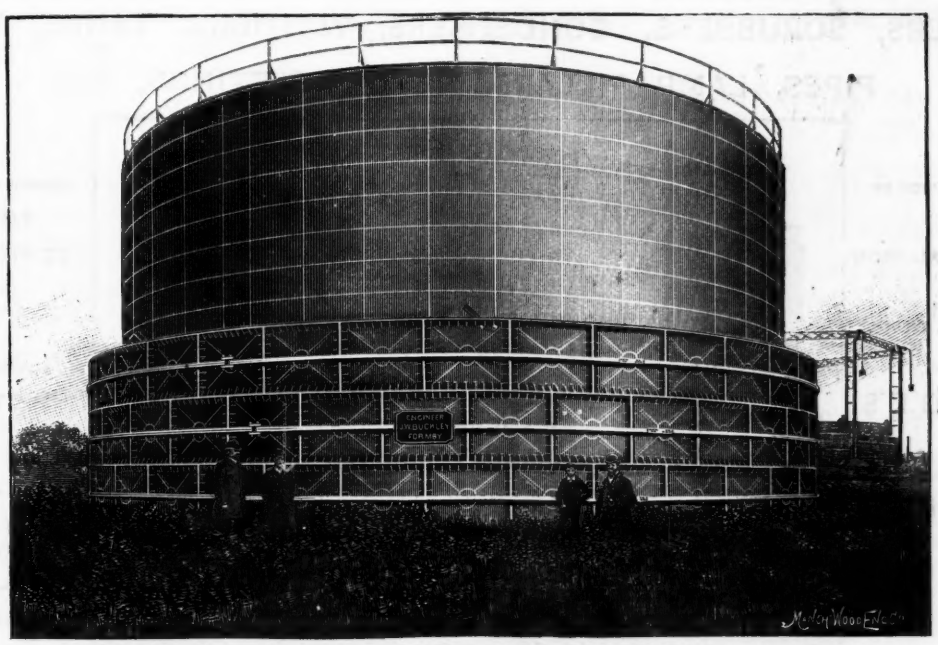
To **Messrs. R. & J. DEMPSTER,**
MANCHESTER.

GENTLEMEN,—I have pleasure in forwarding you a Photo., of the Spiral-Guided Gasholder and Tank which you erected for us last year.

You will be pleased to learn that it continues to work satisfactorily; the holder rising and falling freely, yet without any oscillation. Here we are situated on the coast, and exposed to the full force of the gales from the Irish Sea; but they have not the slightest effect upon the holder.

Yours truly,
J. W. BUCKLEY.

Telegraphic Address: "SCRUBBER MANCHESTER."



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A Spiral-Guided Gasholder (prepared for telescoping), working in a Cast-Iron Tank made with planed joints.

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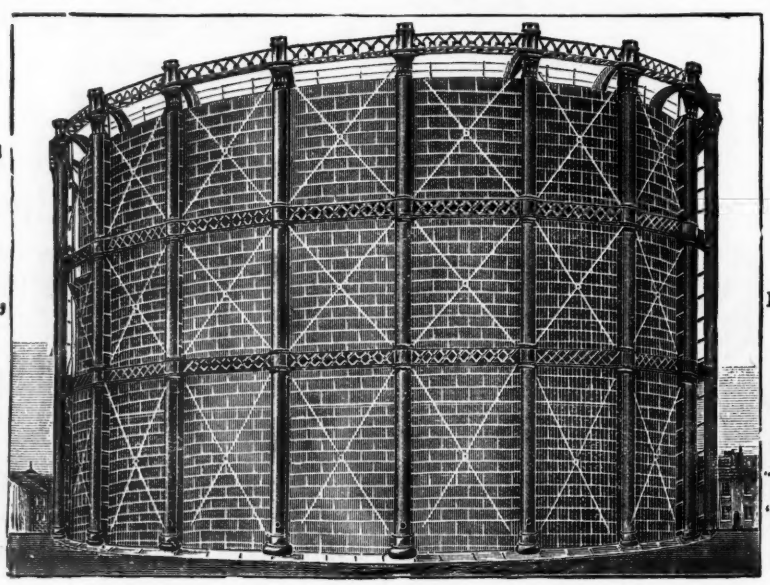

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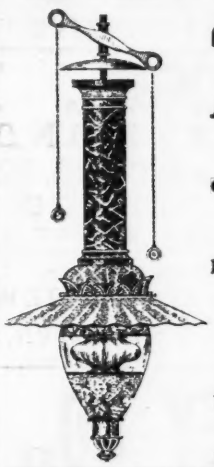
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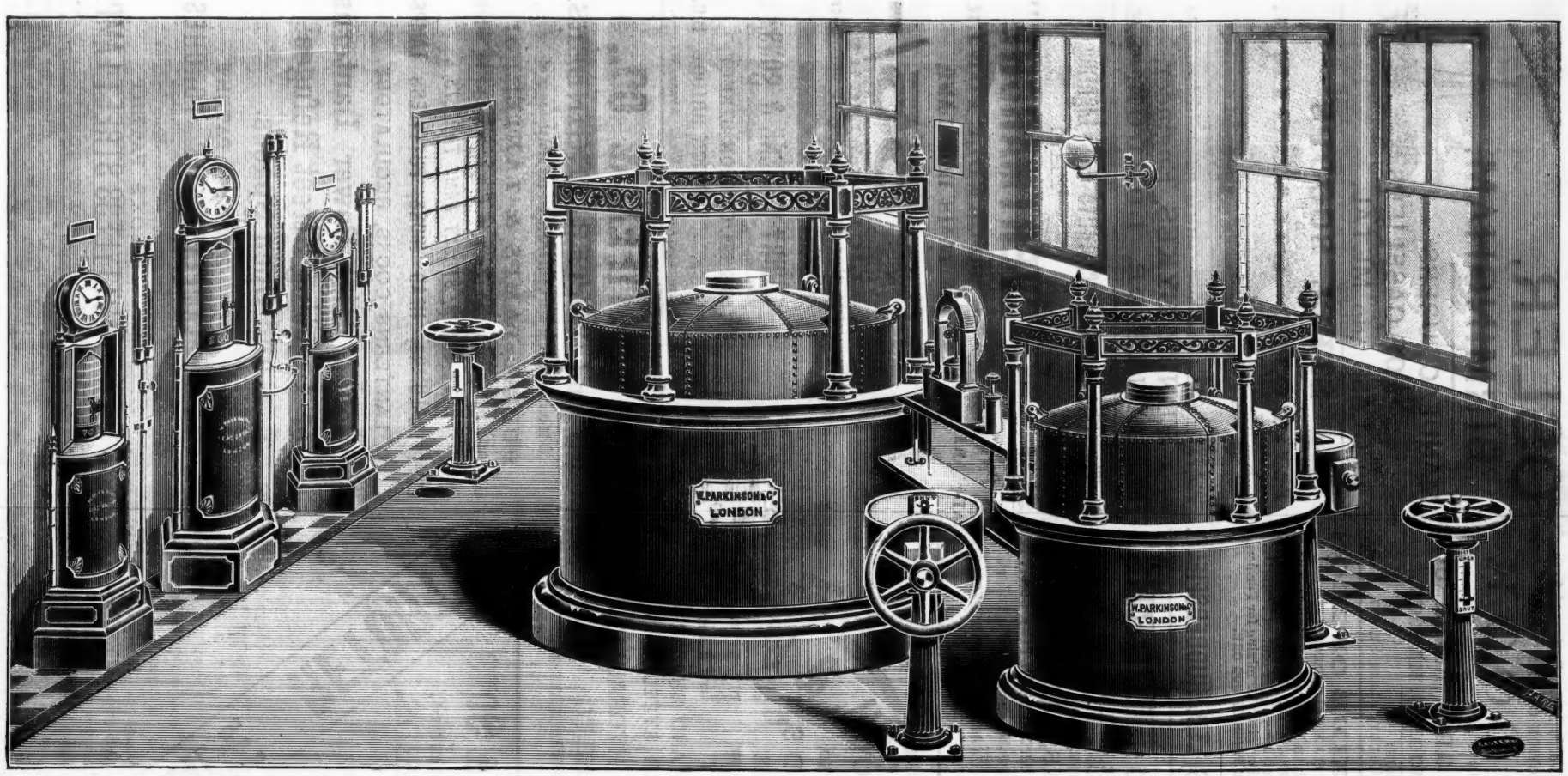

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(TESTIMONIAL.)

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(Signed) G. F. L. FOULGER, Distributing Engineer.

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[See also Advt., p. 216.

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